A

TREATISE

ON THE

Safety *and* Maintenance

OF

STATES,

By the Means of

FORTRESSES.

Tranſlated from the original FRENCH
Of M. MAIGRET,
Engineer in Chief, and Knight of the Royal and Military Order of St. LOUIS.

LONDON;

Printed in the Year MDCCXLVII.

TREATISE

ON THE

DUTY and Practice

of a

Captain General, and

Commander in Chief

of all His MAJESTY'S

Forces, &c. &c. &c.

FOR TRESSES

By the Means of

Translated from the original FRENCH

LONDON:

Printed in the Year MDCCXVII.

TO HIS

ROYAL HIGHNESS

THE

DUKE,

Captain General, and Commander in Chief of all His MAJESTY's Forces, &c. &c. &c.

SIR,

WERE Your ROYAL HIGHNESS a Hero only, a Treatise upon Fortresses might

might be an improper Offering to lay at your Feet; but the Talents both of Hero and General are ſo ſtrictly and eminently united in the Perſon of Your ROYAL HIGHNESS, that whatever conduces to the Preſervation of the Soldier, which is the principal Object of this Science, is ſure of Your Gracious Protection.

IT is on this Preſumption, and the Hopes of facilitating under Your ROYAL HIGHNESS's moſt Auguſt Auſpices, the Study of this leaſt cultivated

ted Branch of Military Knowledge in the growing Part of the *Britiſh* Forces, that altho' myſelf employ'd in a diſtant, therefore leſs agreable Sphere of Duty, as wanting the Honour and Advantage of being at once form'd and animated by Your ROYAL HIGHNESS's glorious Example, I have dared in this Manner to approach Your ROYAL HIGHNESS's Perſon; at the ſame time begging Leave moſt humbly to declare, no Attachment is in me ſo ſtrong as my Ambition to ſerve Your ROYAL FAMILY, as

I am with the moſt awful and loyal Duty,

SIR,

YOUR ROYAL HIGHNESS's

moſt devoted

moſt obedient,

and moſt humble

Servant,

J. HEATH

THE AUTHOR's PREFACE.

VANITY to be reputed the Founder of ſome new Syſtem, has contributed not a little to encreaſe the number of thoſe of Fortification; and a fondneſs for writing in general, already overſtock'd us with books on the minute detail of that art; but few, if any before, have in a particular manner and at large, treated of thoſe branches, whoſe knowledge is ſo neceſſary for Officers entruſted with the care of fortifying Places, with certainty to attain that end, which ought to be the principal object of thoſe works, namely, the defence and ſafety of a State.

If we knew not perfectly the uſe, or rather different uſes of Fortreſſes, we might neglect making them in parts where great advantages might be drawn from them: If we were ignorant of the exact number neceſſary, we might engage in a fruitleſs

expence, perhaps an inconvenient one; or from a frugality ill-timed leave a paſſage open to the enemy. If we wanted judgment perfectly to diſtinguiſh the natural ſtrength of ſome ſituations, we might overlook ſuch as a ſmall expence would fortify beyond all the works which the moſt skilfull Ingineers ever invented to this day, or engage in an attempt to fortify ſuch, as it is not in the power of art ever to make capable of a good defence. If we ſhould commit a miſtake either in the dimenſions of the Fortreſs itſelf, or in the number, figure, ſolidity, or conſtruction of its works, it could never produce that entire good effect we propos'd to ourſelves in building it.

Theſe are the reaſons which induced me to write this ſmall Treatiſe, which is indeed no other than a collection of what the moſt excellent Hiſtorians, and beſt Authors have ſaid on the Subject; accompanied with many reflexions I have made on the ſeveral Fortreſſes I have ſeen, both in France, *and in foreign countries, where his*

his Majesty Louis XIV. *of glorious memory, permitted me to go and serve.*

This work is divided into nine Chapters, which I have disposed after the manner I thought most convenient, and each Chapter into as many Sections as its length required. I have likewise preserv'd an order in regard to the subject of each section, and given to each, all the explanations, and distinctions, of which they might stand in need; I may possibly on this account be censur'd for having been too Methodical, to which I answer beforehand, that in handling a subject so extensive as this of mine, order and method are absolutely necessary, if one would not be confused, but would thoroughly instruct the Reader, which ought to be the chief aim of all who write. Fortresses have so many several Fronts to be consider'd, and such a number of circumstances may occur, in appearance the same, that if the particular points in which they vary were not very distinctly explain'd, one might easily confound them, and attribute

tribute to one what properly belongs to another.

The ſeventh Chapter, which treats of the number, figure, and ſolidity of the works of a Fortification, may to ſome perſons ſeem to ſtand in need of plans, profils, and other draughts, to render more intelligible what is there laid down; theſe I have omitted, becauſe without very long explanatory notes they would not have been effectual to that purpoſe with ſuch as are Initiates only, and thoſe who have made any progreſs either in the Theory or Practice will not want them.

I ſhall make no Apology to the Reader on account of the ſtyle or expreſſion; he is ſenſible military men ſhould not ſtand upon ſuch niceties, and that when a work is good in other reſpects, defects of that kind ſhould be pardon'd.

THE

THE TRANSLATOR'S PREFACE.

THIS Piece being in ſome meaſure a Syſtem of Politicks, as well as a Treatiſe on Fortification, I think it not amiſs to acquaint the Reader, that I engaged in the tranſlation for the ſake of the Military part only, but found the Political ſo interwoven with it, and at the ſame time ſo neceſſary towards explaining the ſeveral purpoſes for which Fortreſſes are built, as well as how thoſe ends are beſt obtain'd, that there was no poſſibility of omitting it without maiming the work. I have therefore given it entire, but leave the Political part to the conſideration of Politicians and Stateſmen, the Wiſe and Great, to whom only it belongs to judge of the aptneſs and expediency of fortifying a King-

Kingdom; the immediate province of the Ingineer extending no farther than the making his works as ſtrong as the ſituation allotted him, and other circumſtances, will admit: Tho' both parts are moſt copiouſly handled by our Author, who after weighing the intereſts of States and Kingdoms, has not only treated of the proper meaſures to be taken for their defence, and ſhewn what kind of works are fitteſt for that purpoſe, but has thought it no debaſement of his greater knowledge, to enter into a minute conſideration of the ſeveral materials of which thoſe works are to be compoſed.

Upon the whole, if as himſelf acknowledges, the ſubject appears to be of great extent, I doubt not but he will appear in his choice of it to have beſt conſulted his own genius; unleſs he has ſuffer'd greatly in the Tranſlation, which is ſubmitted to the judgment of the candid reader.

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ERRATA.

PAGE 7. line 18. for *abſolutely*, read *abſolute*.
Page 8. l. 8. and 9. dele the two initial Comma's.
P. 17. l. ult. dele *of*.
P. 19. l. ult. for *frther*, r. *farther*.
P. 91. l. 3. r. *Ariſtodemocracies*.
P. 99. l. 12. for *Place where*, r. *Parts in which*.
P. 105. l. 11. for *Incendiaries*, r. *Burnings*.
P. 117. l. 17. for *Sectos* r. *Seſtos*.
P. 122. l. 9. for *vactæ* r. *vaſtæ*. l. 10. for *ſepe* r. *ſeſe*.
P. 123. l. 13. for *Catones* r. *Cotones*. l. 14. for *Cotones* r. *Cutones*. line penult. for *quemſimillimæ* r. *quam ſimillimè*.
P. 124. l. 7. for *Oſtium* r. *Oſtia*. l. 12. for *wtaer* r. *water*.
P. 125. l. 15. for *Meſſina* r. *Miſenum*.
P. 126. l. 15. for *Meſſina* r. *Miſenum*.
P. 127. l. 5. r. *Miſene*. l. 7. r. *Miſeni*.
P. 165. l. 12. for *were* r. *was*.
P. 166. l. 9. for *ſame* r. *like*.
P. 198. l. 16. for *in their ſubſtance* r. *in their interior ſubſtance*.
P. 223. l. 8. after *Harbour* inſert Comma.
P. 228. l. 14. for *them* r. *it*.
P. 273. l. 5. for *grace* r. *graze*. for *to maintain* r. *maintain*. l. 9. for *he pleaſes* r. *they pleaſe*.
P. 274. l. 14. for *is* r. *are*.
P. 310. l. 24. for *conſequences* r. *conſequence*.
P. 313. l. 9. for *Intereſts of State* r. *Intereſts of a State*.
P. 334. l. 8. for *demands* r. *demand*.
P. 335. l. 17. dele *our*.
P. 348. l. 3. dele *ſhould*.
P. 352. l. 27. for *by* r. *and by*.

A

TREATISE

On the Safety and Maintenance of

STATES,

By the Means of

FORTRESSES.

CHAP. I.

Of the Uſefulneſs and Neceſſity of Fortreſſes.

IT is a Problem of long ſtanding in Politicks whether Fortreſſes are uſeful or neceſſary in a State. The queſtion is of very great extent. In order to treat of it in as diſtinct a manner as poſſible, we ſhall divide this Chapter into three Sections: In the firſt we ſhall demonſtrate the Uſefulneſs and Neceſſity of ſuch Fortreſſes as are built for the defence of a State againſt foreign or external enemies.

In the ſecond we ſhall ſhew the like motives ſubſiſting in regard to thoſe built with a view to domeſtick or internal enemies, and in the third ſection ſhall conclude the uſefulneſs and neceſſity of Fortreſſes in general.

Section I.

Of the uſefulneſs and neceſſity of Fortreſſes, in regard to Foreign Enemies.

AS the Politicians who are againſt all Fortreſſes in a State, condemn them in thoſe very reſpects in which the others approve them, or to expreſs myſelf more clearly, as the one maintain the direct contrary of what the others advance, the uſefulneſs of them will ſufficiently appear when we ſhall have refuted, one after another, the ſeveral reaſons offered by thoſe who think them diſadvantageous.

The Politicians who condemn the uſe of Fortreſſes in regard to foreign enemies, make the following objections:

Objection I.

It would turn to a much better account if the expence of their conſtruction and maintenance were ſpared, in order to raiſe Armies with the Money if there ſhould be occaſion.

Whoever

Whoever is of this way of thinking we deſire to inform us, how a Prince, let him be ever ſo powerful, can ſecure himſelf againſt an unexpected attack from a neighbouring Prince of equal power, without Fortreſſes? In anſwer to this, it may be ſaid, that when one Prince ſees another arm he ought to arm himſelf. This might be ſufficient if there were only thoſe two in the world, of whom there are ſo great a number, that if ſome are at peace, others are at war; and it may ſo happen, that in the very articles of their agreement and making up matters betwixt themſelves, they may join in a league to fall upon a third, and this ſo ſecretly carried that the party concern'd may not have the leaſt intimation of it; as happen'd to the *Venetians* at the League of *Cambray*, of which whole Treaty * nothing farther tranſpired than that it was a confirmation of the peace betwixt the two Princes; and the League was kept ſo ſecret, that the *Venetians* felt the effects of it before they receiv'd the intelligence. Beſides, when a Prince takes arms, he pretends his object is ſome other State, as the Grand Seignior did in regard to the Iſle of *Candia*, and has done on many other occaſions; on which the Prince preparing for war doth it ſo covertly and with ſuch ſpeed that his intended enemy can have no time to put himſelf upon his defence. *Cræſus* King of *Lydia*,

* *Mezeray*, 1509.

the richeſt Monarch of his Age, was ſo unexpectedly attack'd by *Cyrus*, that he was forc'd to leave his Capital *Sardis*, to draw what troops he could together, and give his enemy battle: He loſt the day, retired with the broken remains of his army to *Sardis*, which the enemy forc'd, took him priſoner, and ſtrip'd him both of his treaſures and his Kingdom; Whereas had his Frontiers been guarded by Fortreſſes too conſiderable for an enemy to have left behind him, and ſtrong enough to have made a reſiſtance for ſome time, he might have expected ſuccours from his allies, recruited his army with his treaſures, march'd out to meet the enemy, and perhaps been Conqueror at laſt; for it has been often ſeen in war, that the party too weak at firſt to make reſiſtance hath had the better on't in the end, as happen'd to thoſe *Venetians* themſelves, who by means of their treaſure wholly recover'd at laſt all they had loſt at the beginning of the Siege of *Candy*.

Objection II.

It would better anſwer the purpoſes of a State, even to maintain Armies conſtantly in the field, as the Romans *did formerly, and as the* Turks *do at this day, and as did the Viſcomtis formerly Sovereigns of* Milan, *particularly* Azzo Viſcomti, *who kept twenty*

twenty thouſand horſe generally in pay; this would be a certain means of keeping ſubjects to their duty, neighbouring ſtates in awe, to prevent any deſigns of the enemy, to ſurpriſe them if ſupine or negligent, and to take advantage of any favourable unexpected opportunity that might offer.

It is for very powerful Princes only to put this Maxim in practice, and that not without grievous inconveniences attending it. It is not altogether prudent for a Prince to put his whole confidence in a ſingle Army, which an epidemical diſtemper may happen to ſeize and reduce to nothing. Soldiers may mutiny and revolt of themſelves, or their Leaders may ſeduce them. Who deprived *Galba* both of his life and Empire, but *Otho* with *Galba*'s own Soldiers? Who depoſed *Otho*, but that army which the Empire kept in *Germany*, of which *Vitellius* aſſumed the Command? And to what other cauſe is the loſs of the ſame Empire and death of *Vitellius* to be aſſign'd, but to the Army kept by the *Romans* in the *Levant*, and brought to *Rome* by *Veſpaſian*? How many *Turkiſh* Emperors have been depoſed by their Janiſaries? in the very laſt Age *Ibrahim* was ſtrangled and his Son *Mahomet* IV. placed on his throne. And have not thoſe Emperors frequently

quently been conſtrain'd ſhamefully to deliver up to thoſe Janiſaries one or other of their chief Miniſters in order to his being put to death?

To this it may be replied, that as there is a poſſibility of the ſame inconvenience happening to any Prince who in time of war raiſes an Army and ſends it againſt a foreign enemy, he muſt therefore never have recourſe to arms. To which we anſwer, the inconvenience before mention'd is much leſs to be apprehended in time of War than in Peace; in War the near neighbourhood of the enemy finds the ſoldier full employment, he is never idle, but conſtantly either at work or exerciſe; this prevents him falling into ſlothfulneſs, lazineſs, or debauchery, vices that are the ſource of factions, commotions, treaſons, and revolts in the military world.

It may likewiſe be objected, that the Garriſons in Fortreſſes may revolt and the Governors turn traitors to their truſt; ſuch a thing may indeed happen, but a ſingle Garriſon is not to be compared to an Army; and when troops are diſpers'd and ſhut up in ſeparate Garriſons the infection of licentiouſneſs and miſrule is generally of a leſs evil tendency than when the whole are encamp'd together, where the feaſableneſs of making an eſcape after any evil committed emboldens them to the attempt; cut off as they are from commerce with men of other profeſſions, they loſe all ſentiments of humanity and civil ſociety; a certain habit and

fami-

familiarity they contract by converſing only with one another make them a people of themſelves, as cloſely link'd in bonds of ſociety and intereſt as the inhabitants of one and the ſame city can poſſibly be.

A Prince who would eſtabliſh his Power on his Fortreſſes might put the moſt faithful and beſt affected of his ſubjects into the places of greateſt importance; it is not poſſible that all his garriſons ſhould at once revolt by conſent, and if only a few fall off, they will hardly be of ſo much weight, in a large or even in a mean Principality, as to turn the balance of power abſolutely againſt the Sovereign, without leaving him ſome reſource; whereas an Army compoſed of the whole ſtrength of a State is abſolutely miſtreſs of the fate both of Sovereign and People.

Objection III.

A Prince ſhould uſe no other means for his defence, but the bravery of his Citizens.

'Tis a ſhameful and diſhonourable thing, ſays *Ariſtotle*,* when we have to do with an enemy no more in number than ourſelves, to fly to walls for our protection, but ſince there is a poſſibility of that enemy advancing with more forces it is extremely proper and

* Id. Politic. lib. 7. cap. 2.

abſolutely neceſſary to fortify ourſelves ſtrongly, unleſs we chuſe to be cut in pieces, or led in triumph and reduced to ſlavery; eſpecially at this time of day, when Machines for attacking Towns have been invented with all poſſible induſtry. What more could *Ariſtotle* have ſaid, if our great guns had been then in uſe?

If Stratagems are allow'd in War, why not Fortreſſes? being innocent means for our protection, to which nature has by a ready inſtinct inclin'd all animals. The fox when wearied by the hounds, earths in the firſt hole he finds, or leaps into the firſt tree that offers. The wild boar intrenches himſelf in the thickeſt of the foreſt, the ſtag takes the ſtream, and the roe-buck climbs the ſummit of the rock. Nature herſelf has taught mankind the firſt principles of Fortification. The almoſt inacceſſible rocks and mountains, places ſurrounded with abyſs of rivers, ſeas, or other waters, theſe furniſh'd him with the firſt hints of raiſing ramparts with high walls, and digging deep ditches before them, to enable him to reſiſt the attacks of a ſuperior number of his enemies.

Objection IV:

Fortreſſes ſerve only to raiſe the ſpirits of the aſſailants, and to diſcourage and diſhearten the aſſail'd, who ſee there is

no

no confidence placed in their valour; 'tis on this account Plato *has condemn'd them, and* Lycurgus *for the ſame reaſons would not allow that* Sparta *ſhould be fortified. The Citizens asking him the queſtion why he would not permit their city to be wall'd, he gave them for anſwer, the city was not without its walls, for it was girt round with men of valour, not with bricks; and a* Lacedemonian *ſeeing a city incloſed with fine ſtately walls, what a delicate ſeraglio is that, ſays he, for the women within!*

'Tis true that *Plato* ſpeaking of Fortreſſes commends the cuſtom of the *Lacedemonians* in not allowing of them, and ſays,* they were apt to make men effeminate, ſlothful, and cowards, imagining themſelves there out of all reach of inſults from the enemy; however he has not condemn'd them abſolutely, for afterwards he ſays, 'Whenever men have occaſion to make 'uſe of walls for their protection they ought to 'be built in ſuch a manner that their incloſure 'may be of a circular form, and their ſituation 'high, to have the greater command, *&c.*

* *Plato's* Commonwealth, Book 6.

Lycur-

Lycurgus himſelf, that moſt excellent Legiſlator, was much deceived in the particular of Fortreſſes. When fortune frown'd upon his country, how often was the city of *Sparta* on the very brink of being taken and deſtroy'd by her enemies? and was not *Ageſilaus* from the very ſame cauſe conſtrain'd to retreat in the midſt of his conqueſts, and leaving victory behind him fly to the defence of his Capital? it may therefore with truth be affirm'd, Fortreſſes are no leſs uſeful to Princes deſirous to extend their Dominions, than to thoſe who are willing to confine themſelves within the ancient limits of their States.

Ariſtotle affirms,* that 'to pretend to ſay 'that a Town ought not to be wall'd round 'for fear of the citizens becoming effeminate, 'cowardly, and ſlothful by thoſe means, is the 'ſame thing as to ſay we ought to chuſe the 'open plains for our habitation, where we may 'be moſt eaſily attack'd. That we ſhould level 'the mountains and ſteep rocks, and that peo'ple's houſes ought not to have walls about 'them; whereas it is to be conſider'd, that 'when towns have ramparts for their defence, 'they either may or may not be made uſe of, 'as beſt ſuits the occaſion; but where theſe 'are wanting, there is no choice but a neceſſity 'of engaging in the open field; this being the 'caſe, towns ought not only to be walled

* De Politic. lib. 7. cap. 2.

'round,

'round, but all imaginable câre and pains 'taken that thoſe walls be properly con-'ſtructed.'

This Argument of *Ariſtotle's* is extremely judicious, for a party may happen to be ſo inferior in numbers to the enemy, as to be incapable of making any reſiſtance except in a Fortreſs only, and having one to retire to, may from thence oblige the enemy to abandon their enterprize. '* The *Byzantines* finding them-'ſelves too weak to oppoſe *Philip* of *Macedon*, 'quitted the field to him, and ſhut themſelves 'up in their own city, by which means they 'obliged that Prince to draw off his forces, 'being unwilling to engage in a long ſiege. '*Aſdrubal* from the ſame motives ſhut up all 'his troops in towns on the approach of *Scipio*, 'and by thoſe meaſures obliged him to ſend 'his own into winter quarters, either for that 'the ſeaſon was too far advánc'd for under-'taking Sieges, or not chuſing to engage in 'the attack of ſo many Places.

When there is not too great a diſparity of numbers to hope for victory in a pitch'd battle, and that meaſure is thought moſt eligible, Fortreſſes are no impediment to the purſuing it, and the taking ſuch a ſtep cannot but extremely animate the Soldiery, by the confidence they ſee placed in their valour, and equally tend to the diſheartening of the enemy, when

* *Frontin.* lib. 1. cap. 3.

they

they ſee their adverſaries, tho' inferior in number, voluntarily foregoing an aſſured advantage to engage them upon equal terms, which they can attribute to no other cauſe but a contempt of themſelves, and a daring confidence of ſucceſs: Whereas had they no Fortreſſes their enemies would regard that action as the effect of neceſſity only. Theſe were the reaſons, or nearly the ſame, which **Miltiades* made uſe of to prevail on the *Athenians* to leave their city and engage in the open field thoſe nations which came to attack them, led by *Datis* and *Artaphenes*.

The Politicians that approve of Fortreſſes maintain, that inſtead of exciting the courage of an enemy, they oftener turn the edge of his appetite for war, not chuſing lightly to engage with one whom they know poſſeſs'd of a ſtrong hold, and well retrench'd. They even ſay, they augment the courage of the aſſail'd. † Cardinal *Richlieu* was of this opinion, eſpecially in regard to the *French* nation. 'Fortreſſes, ſays he, are the more neceſſary in 'this Kingdom, as the unſteadineſs of our 'countrymen rendering them unfit for foreign 'conqueſts, their natural valour would make 'them invincible at home in their own de'fence, provided they had large towns ſo well 'fortified and ſupplied with neceſſaries of all

* *Corn. Nepos, de vita Miltiadis.*

† Political Will of *Richlieu.*

'kinds,

'kinds, that they might have an opportunity 'of manifeſting their courage, without being 'expoſed to the enduring of great hardſhips, 'the only enemies they have to fear.

'A well fortified Frontier is capable either of 'putting an enemy out of conceit with form-'ing deſigns againſt the State, or of putting a 'check to his career, if he is bold enough to 'make an attempt by open force.

'The volatile ſpirits of our people require 'ſome ſtay or ſupport againſt thoſe impreſſions 'of terror they are capable of receiving from 'an unexpected attack, were they not per-'fectly well aſſured, that all the approaches 'to this Kingdom are barr'd by ramparts ſo 'ſtrong, that no foreign violence can poſſibly 'force them at once, or till after much time 'ſpent make themſelves maſters of them.

Objection V.

When war is once declared, 'tis not in Fortreſſes alone to ſtop the progreſs of the enemy, or to prevent his incurſions; nor ſhould he attack them, would the reſiſtance they were capable of making, afford ſufficient time for raiſing their ſiege; for when once an enemy is maſter of the field, he is very ſoon maſter of the fortreſ-

fortreſſes: And Machiavel *ſays,* that when a Prince is without good Armies let him have as many Places as he thinks fit both in the heart of his country and on his frontiers, they will only be prejudicial or at beſt uſeleſs to him; prejudicial, becauſe if they are weak they are eaſily taken from him and turn'd againſt him, or if too ſtrong for the enemy to carry, he will leave them behind him, and conſequently they will become uſeleſs, for Armies compoſed of dauntleſs fellows, if not oppoſed by other armies making head againſt them, march ſtrait forwards without troubling themſelves about what places they leave behind them, as is evident from Hiſtory; and of which we have ſeen an inſtance in our own time in* Francis-Mary *Duke of* Urbin, *who left ten of the enemies towns behind him, and without giving himſelf any trouble about them went and beſeiged that of* Urbin.

* Political Diſcourſe, book 11, chap. 2, 4.

If by Fortreſſes *Machiavel* means ſuch inconſiderable Places as may be carried ſword in hand, or ſuch as are too ſmall to contain a garriſon capable of giving any diſturbance to that army which contemns them, he is in the right; but if by Fortreſſes he means as he ought to do, Places fortified according to the rules of art, ſuch as are not to be taken without being attack'd in form, and large enough to contain a body of troops capable of intercepting a convoy, foraging party, or other detachment, of incommoding or harraſſing an army on its march, or in a word, either forcing the others to come and attack them, or to quit the country, his Propoſition is falſe. The beſieging ſuch Places is a work of time, deſtroys abundance of men, is the ruin of an army, and when they are defended with obſtinacy things ſometimes take a turn during the Siege.

Many famous Politicians are of ſentiments very oppoſite to thoſe of *Machiavel* in this reſpect; they think that Fortreſſes upon theſe occaſions are very near as effectual as Armies in the Field, becauſe where a ſingle one only preſents itſelf to the enemy, if he durſt not attack it, he durſt not leave it behind him and penetrate into the country, the only means he has of preventing the aſſailed's drawing all his forces together to give him battle. The *Danes* about fifteen years ago having made a deſcent upon *Scania*, wanting either reſolution or neceſſaries to make themſelves maſters of *Chriſtianſtadt*,

tianſtadt, which guards the Paſs betwixt that Province and *Sweden*, all they could do was to over-run and ravage that Province; in the mean time Count *Stembock* having drawn the Militia and what regular troops there were at that time in the Kingdom together, march'd in queſt of the *Danes* whom he attack'd and defeated, and obliged them to repaſs the ſeas with the broken remains of their army. Had not *Chriſtianſtadt* been fortified the *Danes* might have penetrated at once into *Sweden*, and had never permitted Count *Stembock* to form a large body of an army, at leaſt might have obliged him to come and engage them at a diſadvantage in thoſe Straits betwixt *Sweden* and *Scania*.

If the enemy attacks the Fortreſs, it will coſt him ſome time ſo to do, and whilſt he is weakening his own numbers the Prince aſſail'd will have the opportunity of drawing his troops together and forming his army. In the year 1544 *Charles* V. having march'd into *France* with all his forces, and the flower of thoſe of the Empire, was detain'd ſix weeks by S. *Dizier*, where he was forc'd to ſpend the beſt part of the ſummer, and but for the Peace then concluded, was on the point of making an inglorious return into his own country, after nothing done.

Where a Prince has not a ſufficient number of forces himſelf, Fortreſſes give him time to expect ſuccours from his allies, and afterwards

to

to march to the relief of thoſe Fortreſſes which are attack'd; did not the long defence made by the city of *Caſal* give time for the allies of its Sovereign to march to its relief? and that of *Vienna* to the army of the Emperor *Leopold*, and of *Sobieski* King of *Poland* to march in conjunction to its deliverance in 1683? *Caſal* therefore preſerv'd the *Monferat* to the Duke of *Mantua*, and *Vienna Auſtria* to the Emperor.

If the Prince attack'd thinks he ſhall hardly be able to oblige the enemy to raiſe the ſiege, being either too ſtrong for him, or too advantageouſly poſted, after throwing ſome ſuccours into the Place of that kind they ſtand moſt in need of, he may go and fall upon ſome town of the enemy. *Henry* IV. being determined to march into *Flanders*, becauſe he would leave no town behind him, laid ſiege to *La Fere*; by this means the Arch-duke *Albert* had time to draw his forces together, but not being ſtrong enough to oblige the King to raiſe the ſiege, after throwing ſome ſuccours into the Place by means of the famous *George Baſſa*, he march'd himſelf and attack'd *Calais*, a town of much more conſequence than *La Fere*; where he ſo effectually intrench'd himſelf, and made ſo good a diſpoſition of his quarters, that it was not poſſible for the *French* to relieve it; at laſt he took it by ſtorm.

There is indeed a very recent inſtance which might be produced to the contrary of what I am now ſpeaking of, 'tis what happen'd in regard

to the States of *Holland* in the year 1672, of Campaign of *Lewis* XIV. where we ſaw a great many good towns, which had formerly diſtinguiſh'd themſelves by the good defence they had made, ſubmit to the arms of the King of *France* in a very ſhort time; but this example, applicable as it may ſeem to the preſent purpoſe, deſerves no kind of conſideration. The Places were ill provided, or not in a condition of defence. The great warlike abilities as well as power of the Prince by whom they were attack'd, the ſuddenneſs of the attack itſelf, the ſurprize and perhaps irreſolution of their Governors might make them for a time forget what they ow'd their country. Armies themſelves under ſuch circumſtances have never had better ſucceſs.

Objection VI.

Fortreſſes in time of war will not ſerve as places of refuge for the people of a whole country to retire into with their effects; too great a number would be wanting for ſuch a purpoſe, which might be falling into another dangerous inconvenience; the country therefore is not leſs expoſed to pillage and waſte on their account, the diſorder and confuſion there is not the leſs; The affairs

fairs of commerce, the vintage, and the adminiſtration of juſtice are not the leſs interrupted, and the inhabitants of the country enjoy never the more quiet or ſecurity; in ſhort, the rage of war is not the leſs violent.

It is not neceſſary that Fortreſſes ſhould be ſo large as to receive all the Peaſants in their neighbourhood, and all their effects in general, in order to prevent the chief diſorders of war; nor even ſuppoſing they were ſo, and ſtored with a ſufficient quantity of proviſions, would it be prudent in a governor to admit them at a time when he is threaten'd with a ſiege, unleſs they had no where elſe to retreat, as in ſome iſland remote from the ſhore. Such a multitude of men, women and children as the firſt panick would drive into the Place, ſtruck with the deſolation of their country, the terrors of a ſiege, and there all crowded and ſtived together, might breed a contagion; and the extreme miſery of their condition could not but incite the garriſon to wiſh to free themſelves at any rate from ſo ſad a ſpectacle. The benefit thoſe of the country might receive from Fortreſſes, in caſe of any ſudden alarm is the opportunity of ſecuring their principal effects in thoſe which are neareſt them, and themſelves to retire frther into the country; but if they have

timely notice before-hand, they may carry their whole effects along with them into thoſe retreats where the enemy cannot penetrate, having ſufficient leiſure ſo to do; in which caſe the profit they will be able to make by the advanced prices of what they ſhall ſave and ſell afterwards, will make them ample amends for the damages done their houſes or lands by the enemy; but if they have only time to purſue the firſt courſe, the loſs they will ſuſtain cannot be very conſiderable. In ſpeaking after this manner we ſuppoſe the war executed with its utmoſt rigours, for when theſe particular points are ſettled by Conventions, as they were in *Flanders* and upon the *Rhine* in the laſt wars of the ſixteenth and ſeventeenth centuries, the war is ſo far from ruining the inhabitants of the country, that it is upon ſome occaſions profitable to them; they may depoſite their beſt effects in the places of ſtrength, they may ſtay at home in ſafety themſelves, they may carry on their vintage, the town inhabitants their trades, and juſtice be as regularly adminiſter'd as in time of peace under the protection of thoſe Fortreſſes.

Objection VII.

If in the courſe of war any defeat ſhould happen, or an opening given to the enemy, Fortreſſes can neither put a ſtop to the conquering army, nor give time

time for their own to rally, or for drawing new troops together, or waiting the arrival of their allies, in order to recommence hoſtilities.

This Propoſition may be refuted by an infinite number of examples to the contrary; what ſtopt *Hannibal* on his march againſt the *Romans*, but the long defence made by *Spoleto*, and by other ſmall places which he attack'd? What preſerv'd *Flanders* to the King of *Spain*, after the loſs of the battle of *Nieuport* in the year 1600, but the Fortreſſes? the *Hollanders* had a compleat victory, and remain'd maſters of the field, yet were neither able to make themſelves maſters of *Flanders*, nor even won two inches of ground. Had there been no Fortreſſes in *Piedmont* after the loſs of the battle of *Marſeilles* (1693) it had follow'd the fate of the reſt of the Duke of *Savoy*'s Dominions, the preſent King of *Sardinia*; and the winning thoſe of *Fleurus* in 1690, *Nerwind* in 1693, *&c.* had made *Lewis* XIV. maſter of all *Flanders*, but for the ſame impediments. Examples ſtill more recent might be produced in proof of this aſſertion, but it is a truth ſo well known we think them unneceſſary.

Objection VIII.

When a State having Fortreſſes is once loſt the Prince cannot hope to recover his

dominions, but after abundance of time and at a very great expence; on the other hand, if a State having no Fortreſſes is eaſily loſt, 'tis as eaſily recover'd.

It will admit of no diſpute, that where towns lie open, the recovery of ſuch a State will be attended with ſo much the leſs difficulty; we have an inſtance of this in the hiſtory of *Spain*; in the year 712, the children of king *Vitiza* having been driven out of that Kingdom by *Roderic*, whoſe father *Vitiza* had deprived of ſight, retired into *Africa*, where having obtain'd from *Muza*, the Caliſe of the *Saracens* Lieutenant, conſiderable ſuccours under the command of *Tarec*, that General without any difficulty, and in a very ſhort time, made himſelf maſter of the greateſt part of the Kingdom, *Vitiza* having diſmantled all the towns in *Spain* *Toledo* only excepted. But if the recovery of a Kingdom whoſe towns are fortified is an undertaking of difficulty, the conqueſt of it, which is neceſſary in the firſt place, ſurely cannot be leſs ſo; the conqueſt therefore neceſſarily preceding the recovery we muſt conclude that it is for the advantage of the Princes poſſeſſors to have Fortreſſes on their Dominions, or where they have them not, to make them. If when there are no Fortreſſes on a State another Prince ſhould make himſelf maſter of it and build

them

them afterwatds, the Prince diſpoſſeſs'd will not be able in that caſe to recover his country with the ſame eaſe he loſt it: And indeed all expectations of that kind will be deſperate. *Mahomet* II. having made it his obſervation, that altho' his predeceſſors had often made themſelves maſters of the town of *Tauris* in *Perſia*, and of all the adjacent country, yet having no Fortreſſes on the ſpot, their armies had been as often obliged to retire and the *Perſians* recover'd it; he was no ſooner poſſeſs'd of it himſelf, but he built one, and ſecured by that ſtep both his poſſeſſion and his conqueſts. *Selim* I. Emperor of the *Turks*, did the like after conquering the Dominions of the Sultan of *Egypt*; and the *Spaniards* purſued the ſame meaſures when they made themſelves maſters of the *Valtoline*.

Objection IX.

Laſtly, they who diſapprove of Fortreſſes ſay, *That a good army is ſufficient to preſerve and inſure a ſtate to its ſovereign, without the aſſiſtance of one fortified town, which fortreſſes cannot do without an army, becauſe they are all of them liable to be taken either by force, by ſtratagem, or by famine; by force thro' the violence of*

artillery, which the ſtouteſt walls are unable to reſiſt, while their fury prevents the beſieged within from making new retrenchments. By ſurprize, thro' the negligence of thoſe who ought to guard them, or thro' their avarice or infidelity, as happen'd to the city of Milan *in the year* 1499, *thro' the infamous treachery of* Bernard Curtius. *Laſtly, by Famine, from their want of ſufficient ſtore-room to contain ſuch a quantity of proviſions as is neceſſary to ſubſiſt the garriſon for a longer time than the beſiegers army ought or may be expected to lie before the town.*

The former of theſe two propoſitions is falſe, no event being more uncertain than that of a battle; ſmall armies have frequently overthrown much greater numbers than themſelves, and put them entirely to the rout; of this hiſtory affords us an infinity of examples, and no ſooner has fortune declared for either party in one ſingle battle but if the unfortunate have no Fortreſſes the party favour'd carries all before him, none thinking it a diſgrace to ſubmit to the laws of the conqueror. Where there are

no

no fortified towns the loſs of a ſingle battle may involve the whole Kingdom in its fate. In the civil wars between the Houſes of *York* and *Lancaſter*,* the Kingdom of *England* having no Fortreſſes, was three times conquer'd in ſix months. *Bohemia* having no fortified towns, *Frederick* Palatine, who had been proclaimed King loſt the whole Kingdom by loſing the ſingle battle of *Prague*; and for a later inſtance, had the Frontiers of *Poland* been fortified on the ſide next *Livonia*, *Charles* XII. King of *Sweden*, had never been able to have penetrated into the heart of that great Kingdom, there to ſuccour the malecontents, engage others to declare for him, oblige King *Auguſtus* to fight him at a diſadvantage; and at laſt, by carrying the war into *Saxony*, force him to abdicate and renounce the Crown of *Poland*: And from the ſame cauſe, after the ill ſucceſs of the battle of *Pultowa*, King *Staniſlaus* who had ſucceeded him, was obliged to abandon his conqueſt, and leave King *Auguſtus* to remount the throne; ſo that a Sovereign without Fortreſſes can never be aſſured of the ſtability of his fortune.

The ſecond propoſition, that Fortreſſes without an army can never preſerve and inſure a State to its Sovereign, being all liable to be loſt either by force, ſurprize, ot famine, determines nothing againſt Fortreſſes; it is very certain that many of them have been taken by one or other of thoſe means, but it doth not thence

* *An.* 1471.

thence follow, that all muſt neceſſarily be ſo; there are an infinite number of examples in which attempts of each kind have miſcarried; amongſt thoſe which have been attack'd by open force did not the city of *Metz* by its ſtout and obſtinate reſiſtance force the Emperor *Charles* V. to raiſe the ſiege? Did not the city of *Vienna* in the year 1529 reſiſt all the powerful efforts of the formidable army of *Soliman* II? Did not the city of *Malta* in the year 1565 ſhare the ſame glory? beſides a multitude of others. And of thoſe which have been attack'd by ſurprize, as *Arras*, *Geneva*, *Old Briſack*, *Cremona*, and many others, were they taken by thoſe means? Laſtly, of Fortreſſes which have been attack'd by famine, which of all three is the moſt terrible, the city of *Naples*, *Leyden* in *Holland*, *Canice* in *Hungary*, *Cremma* in *Italy*, *&c.* were they not all preſerv'd with their reſpective garriſons?

In the life of the Duke d'*Alba* there is a ſpeech on the ſubject of the advantages of Fortreſſes, deliver'd to the people of *Rome* aſſembled before the Capitol, by the Duke d'*Urſini*, who was as fam'd for eloquence as valour, and which is well worth relating.

'When triumphant *Rome* ſaw herſelf miſtreſs 'of the world, when either her own armies 'or the profound ſubmiſſion paid her by all 'nations had left her nothing to fear, ſhe for-'tified, not that ſhe was afraid, but that ſhe 'might never have cauſe to fear; that if the

'occaſion

‘ occaſion ſhould offer, ſhe might at leaſt have
‘ the means of retiring within herſelf, there to
‘ make a ſtand and keep fortune at a bay, till
‘ victory ſhould have time to declare on her
‘ ſide. Let us but remember how the Great
‘ *Alexander* ſaw fortune ready to abandon him
‘ before *Tyre*; and that even victorious *Rome*
‘ was baffled before *Numantia*. Be a people
‘ ever ſo brave, ever ſo indefatigable, if they
‘ have no fortified towns their greatneſs muſt
‘ be of ſhort duration, and we may compare
‘ them to thoſe huge bulks of matter, which
‘ having nothing ſtable in them fall to pieces
‘ in a very ſhort time? 'tis what the experience
‘ of ſeveral ages has proved beyond all poſſibi-
‘ lity of doubt: Beſides, when once a panick
‘ has ſeiz'd an army, the enemy is ſure ever
‘ after to beat them in the open field, whereas
‘ if they meet but with a river for their Gene-
‘ ral to encamp behind, they reſume their
‘ courage and very frequently repel the enemy?
‘ ſo eaſy a matter is it, to ſtop the career of a
‘ conqueror? but if they have a ſtrong town
‘ into which to throw themſelves, that con-
‘ queror is no more, his efforts are vain, the
‘ vanquiſh'd then have time to breathe and
‘ recover their ſpirits; they harraſs and weaken
‘ their enemies by frequent ſallies, or by at-
‘ tacks hardily maintain'd, and find them em-
‘ ployment for abundance of time; in the
‘ mean while he ſets his new levies on foot,
‘ brings powerful ſuccours into the field, ruins

‘ the

'the beſieging army, either by cutting off their 'ſupply of water, or forcing their lines. How 'many Great Leaders have miſcarried before a 'well fortified Caſtle; how many mighty ar-'mies entirely deſtroy'd before the ramparts 'of a Citadel? where they have not only the 'enemy to cope with, but the heavens like-'wiſe; the piercing cold, ſcorching heat, rain, 'ſnow, hail, ſtorms, want, ſickneſs, rage and 'deſpair. Who is not ſenſible how greatly it 'avail'd the Imperialiſts the taking *Francis* I. 'priſoner? had not the good fortifications and 'reſolute defence of *Pavia* detain'd him, he 'had never faln into their hands. *Charles* V. 'almoſt conſtantly victorious in the open field, 'found the walls of *Marſeilles* and of *Metz* the 'boundaries of his Victory and Fortune; from 'whence he was glad to ſcamper, tho' with a 'very conſiderable loſs.

SECTION II.

Of the uſefulneſs and neceſſity of Fortreſſes in regard to domeſtick enemies.

THE Politicians who diſapprove of Fortreſſes, object to them as follows:

Objection I.

Princes can have no better means of defence

fence than the true and faithful affection of their ſubjects, and 'tis more for the advantage of all Sovereigns, to make themſelves belov'd than fear'd.

We agree that a Prince can have no better Citadels than the hearts of his people, and that thoſe alone are ſufficient to maintain his authority; but as we can aſſure ourſelves of nothing from the inconſtant nature of mankind, who love to-day and hate to-morrow, without cauſe or reaſon, it is neceſſary that a Sovereign, tho' ever ſo well belov'd, ſhould be in a capacity of making himſelf fear'd likewiſe; that is to ſay, he muſt have Citadels, otherwiſe upon every the moſt trifling occaſion, he will will be left entirely to his ſubjects diſcretion.

Objection II.

Citadels built againſt the ſubject are the bane of that love and confidence they ought to place in their Sovereign, and inſtead thereof beget perpetnal fears and jealouſies leaſt the Sovereign ſhould make uſe of them as inſtruments for their oppreſſion; for proof of this they inſtance the joy the Grecian *cities expreſs'd*

expreſs'd when the* Romans *caus'd their Citadels to be demoliſh'd; they inſtance likewiſe the behaviour of the people of* Antwerp, *when that front of their Citadel next the town was demoliſh'd purſuant to the advice of the Prince of* Orange; *their joy was ſo exceſſive, and ſuch numbers of workmen voluntarily offer'd themſelves, meerly for the ſake of the agreeableneſs of the task, that even ladies of the firſt rank in the night time could not forbear reſorting thither, till tipling and dancing introducing farther irregularities, the night-working was forbid. In imitation of* Antwerp's *example thoſe of* Ghent, Utrecht, Valenciennes, Liſle, *and many other places, celebrated the demolition-day of their Citadels as the ſecond birth-day of their Liberties.*

If they are good ſubjects, well affected, and of the ſame Religion with their Prince, they will not only be ſatisfied, but pleas'd with any

* *Strada*, lib. 9.

meaſures

meaſures he ſhall take for ſecuring their own quiet and tranquility; but if there be any evil-minded people amongſt them ſeditiouſly inclin'd, and of a Religion different from that of their Sovereign, the Citadels will be a curb upon them, and a ſure means of keeping them to their duty: How many great and opulent Cities have been pillag'd, ſack'd, and utterly deſtroy'd for chaſtiſement of their rebellion, the greater part of whoſe inhabitants, and all the honeſter and richer part have had no ſhare in the revolt, tho' forc'd to acquieſce in it, to avoid the manifeſt danger of oppoſing it, or of expreſſing the leaſt diſlike? When a Prince builds Citadels good ſubjects ought no more to entertain ſuſpicion than when he makes laws for inflicting exemplary puniſhment on thieves, aſſaſſins, and other offenders, and orders ſome ſcaffold to be built for putting them in execution. The joy which the *Greek* cities, the inhabitants of *Antwerp*, and other towns in the *Low Countries* expreſs'd upon the demoliſhing their Citadels merits no ſort of conſideration; 'tis the uſual practice of the common people upon any new incident in a State, to form to themſelves, without knowing why, ſome ſubject matter of hope or fear, and to ſet no bounds to their joy or grief upon theſe occaſions.

Objection III.

They are of no uſe, ſays Machiavel, *but*

but to perſuade a Prince he is in a condition to force his ſubjects, to put him upon experiments, and make him harſh and rigorous to his people in time of peace; a wiſe and a good Prince, ſays Machiavel, *who would not give occaſion for his children to turn one day diſobedient, will never attempt to build Citadels, to make them ſenſible betimes that he depends more on the affection of his ſubjects for the ſecurity of his throne than upon all the meaſures of violence; he inſtances the example of Count* Sforza, *who was no ſooner Duke of* Milan *than he built a Citadel, which, inſtead of being the ſupport, proved the ruin of his deſcendants, from the imagination they entertain'd, that by purſuing the ſame meaſures they would be able effectually to ſecure themſelves againſt any reſentment of their ſubjects, on whom they accordingly exercis'd all acts of tyranny; whereas had they been without Citadels, and unadviſedly maltreated their*

ſubjects,

ſubjects, they might ſooner have been made ſenſible of the dangers they were expoſing themſelves to, and have fallen into better meaſures.

What *Machiavel* ſays may be true upon certain occaſions; if a Prince is of unbounded ambition, and his Principality elective, he may employ his Citadels to the purpoſe of making it hereditary in his family. If he is immoderate in his expences, or exceſſively covetous, or evil adviſed by his Miniſters, he may make uſe of them to tyrannize over his people. Theſe are the circumſtances under which Citadels may be inconvenient, but they are not for this reaſon to be condemn'd, if we would not confound the reaſonable uſe of things with the abuſe which may have been made of them, or the equity of the means with the crime of the miſapplication. 'Tis in political meaſures as in phyſical medicines; if the moſt excellent of the latter which nature has afforded us, are applied to the cure of other ills than thoſe for which they were intended, inſtead of forwarding the cure they are the death of the patient; this doth not however derogate from their goodneſs, neither ought the uſe of them to be forbid on this account; all is owing to the knavery or unskilfullneſs of the phyſician: 'Tis the ſame thing with regard to Citadels, the purpoſe for which they ought to be built is by the aſſiſtance of a

ſmall number to reſtrain the ſeditious and evil-deſigning; if other uſe hath been made of them, they are not for that reaſon to be ſet aſide. Were apprehenſions of this nature to take place we muſt have no arms in our Magazines, nor money in the King's Treaſury, much leſs an army of regular forces, all which may be applied to much more dangerous purpoſes than Citadels are capable of, which are fix'd to their baſes.

Objection IV.

If a Prince, according to Machiavel,* *builds them only, with intent to oppreſs his people, that oppreſſion will animate them ſo ſtrongly to his deſtruction, that Fortreſſes which put him upon thoſe meaſures will not be capable of protecting him from their reſentment, for proof of which he quotes the two inſtances following.*

Pope Julius II. *after having driven* Bentivoglio *out of* Bologna, *cauſed a Citadel to be built there, and put a Governour into it, to puſh thoſe people to extremities, who finding themſelves*

* Politic. Diſc. book 2. chap. 24.

ſo

ſo injuriouſly treated roſe up in arms, and the firſt thing they did was to raze the Citadel; which conſequently was of no benefit to the Pope, but on the contrary of great diſſervice to him; for had he treated thoſe people better, it would have been better for himſelf.

But amongſt the many examples of this kind, the moſt recent, the moſt remarkable in every reſpect, and the propereſt inſtance for ſhowing what abuſe Citadels are capable of, and the advantages of being without them, is what lately happen'd at Genoa; *all the world knows in what manner that city, in the year* 1507, *rebell'd againſt* Louis *King of* France, *who at laſt went himſelf in perſon with all his forces, to bring them to reaſon; having done this, he built the ſtrongeſt Citadel there that ever was known, the ſituation and the manner in which it was fortified, rendering it impregnable; for it ſtands upon the ſummit of a hill which extends itſelf into the ſea,*

call'd by the Genoeſe Codeſa, *commanding both the harbour and a part of the town. It happen'd afterwards, that in the year* 1512, *the* French *were driven out of* Italy, *and the* Genoeſe *revolted, notwithſtanding the Citadel*; Octavius Fregoſa, *who had made himſelf maſter of the town laid ſiege to the Citadel, and by the utmoſt good conduct in his meaſures took it by famine in ſixteen months time.*

'Tis certain when a Prince makes uſe of his Citadels to oppreſs his ſubjects, that oppreſſion will incline them at leaſt to wiſh to free themſelves from his ſubjection; but 'tis not equally certain their averſion, tho' ever ſo great, will put them upon attempting to revolt; if the Inhabitants of *Bologna* and of *Genoa* were irritated to ſuch a degree againſt their Sovereigns, as to take thoſe meaſures notwithſtanding their Citadels, there are on the other hand an infinite number of examples, where the people have been reſtrain'd by Fortreſſes of that kind.

Objection V.

In peace they may be of ſervice, enabling the Prince to do his people what miſ-

chief

chief he pleaſeth, but in time of war they are entirely uſeleſs, becauſe both ſubject and enemy regard them in the ſame light, and 'tis not poſſible for them to hold out againſt both. He inſtances the deſcendants of Count Sforza, *who having render'd themſelves odious by that means, were deſpoil'd of their States, as ſoon as an enemy was found to take up arms againſt them; and ſo far was their Citadel from being any defence to them under thoſe circumſtances, that they would have been much better enabled to have reſiſted the fury of the* French *with their own faithful and well-affected ſubjects, and without their Citadel, than they were with the Citadel and thoſe ſubjects whom they had outraged.*

If a Prince makes uſe of his Citadels to maltreat his ſubjects in time of peace, we agree that if a war happens, in which himſelf ſhould have the diſadvantage, that will happen to him in particular, which never fails to happen to all others in his circumſtances. When a people

have been ill-uſed by their Prince in his proſperity, Fortune no ſooner frowns upon him than they take that opportunity to reduce his power, inſtead of receiving aſſiſtance from them he hears of nothing but grievances and ill-humours; for the people's dread of their Sovereign is of no longer duration than his own power to enforce his commands.

Objection VI.

They are of no uſe to preſerve a conqueſt.

* ‘ *The examples of* France *and* Genoa ‘ *are of themſelves ſufficient, ſays* Machiavel, *to evince that error, to* ‘ *which however I ſhall ſubjoin that* ‘ *of the* Florentines *and* Piſa. *The* ‘ Florentines *built Forts to bridle* ‘ *thoſe of* Piſa, *without conſidering* ‘ *they had always been declared ene-* ‘ *mies to our Republick, that they* ‘ *had been always a free people, and* ‘ *had look'd upon rebellion as the* ‘ *only means of recovering their liber-* ‘ *ties; and conſequently, that to make* ‘ *ourſelves maſters of them we ſhould* ‘ *have put the old* Roman *Policy in*

* Diſc. Polit. lib. 11. cap. 24.

practice,

'*practice, either to unite them to our*
'*own State, or utterly deſtroy them;*
'*for did not we ſee the effects of Ci-*
'*tadels at the coming of* Charles VIII.
'*all of which ſurrender'd to him ei-*
'*ther thro' the treachery or cowardice*
'*of their Governors: And thus, if*
'*had there been none at all, the* Flo-
'rentines *would never have depended*
'*on them for the preſerving of* Piſa,
'*nor thoſe Citadels ſerv'd only as*
'*gates of entrance for the King to*
'*paſs thro' to the city; and it is poſ-*
'*ſible ſuch meaſures might have been*
'*fallen upon for its defence without*
'*Fortreſſes as might effectually have*
'*preſerved it from the* French, *at*
'*leaſt, it is certain they could not have*
'*been attended with worſe ſucceſs*
'*than thoſe which were taken upon*
'*that occaſion.*

'*I therefore conclude, that Citadels*
'*in general are a dangerous and*
'*uncertain means of maintaining a*
'*Prince's own Dominions; and will*

' *always be an ineffectual one for the*
' *preſerving his conqueſts.*

Machiavel with reaſon blames the *Florentines*, for thinking to ſubdue and keep in ſubjection the town of *Piſa* by means of Citadels, which had been a Republick like themſelves, and even at that time might be ſaid to be a powerful one in reſpect to *Florence*. We agree with him, that the *Florentines* had better have united that State to their own, or deſtroy'd it utterly, having the means in their power; but he is in the wrong to repreſent thoſe two meaſures of the *Romans* as general maxims, to the entire excluſion of Citadels; and is miſtaken, if he pretends to ſay, they never put the latter in practice; thoſe famous and ſucceſsful Politicians made uſe not of thoſe three means only, but of ſeveral others, according to the time and circumſtances. In the infancy of their State, when *Rome* was yet thin of inhabitants, it being more their intereſt to have their neighbours for allies and confederates than for ſubjects, in the conqueſts they made in *Italy*, they conducted themſelves as *Machiavel* ſpeaks of, and built no Citadels, for fear of alarming thoſe people with apprehenſions of any ill uſe intended to be made of them in regard to themſelves: but from the time that Republick became powerful in inhabitants, and had carried its wars beyond *Italy*, they made uſe not only

of

of their Colonies, but of Forts and Citadels likewiſe, as is the practice at this day under the name of *Caſtra*, and afterwards under that of *Caſtulla*, from whence our word *Caſtles* is derived. ‘ **Uranius*, ſaith *Tacitus*, being ap-
‘ pointed Governor of *England*, died towards
‘ the end of the year, leaving *Suetonius Pauli-*
‘ *nus* to ſucceed him in his government; who
‘ in two fortunate years ſubdued ſeveral nations
‘ whom he kept in obedience by means of
‘ Fortreſſes: And afterwards, ſpeaking of *Agri-*
cola, he ſays, ‘ Not content with taking
‘ hoſtages he kept a ſtrict hand over them by
‘ Forts and Garriſons, which he had ſo properly
‘ diſpoſed, as to ſtrike a terror into every
‘ quarter of the Kingdom; this made *Galgacus*
‘ the chief of the revolters ſay, in the ſpeech
‘ he made to his own people to animate them
‘ againſt the *Romans*, their Forces are exhauſted,
‘ their Fortreſſes unprovided, their Colonies
‘ full of old men, their Towns inſecure, *&c.*
‡*Mezeray* ſays, that before the eſtabliſhment of the *French* among the *Gauls*, ‘ they had ſcarce
‘ any troops, unleſs in the bordering provinces,
‘ particularly an army upon the upper, and an-
‘ other upon the lower *Rhine*, where they built
‘ a number of caſtles to reſtrain the irruptions
‘ of the Barbarians, and to keep the people in
‘ awe on that ſide, who were no leſs muti-

* Life of *Agricola*.

‡ Tom. 1. pag. 23.

‘ nouſly

'nouſly inclined than the *Germans* them-'ſelves.

The inſtance brought by *Machiavel* of *Charles* VIII.'s paſſage into *Italy* is ill placed here. *Peter de Medicis* *, according to ſeveral authors, coming before the victor's army, they would not permit him to return till he had conſign'd into the King's hands four towns, which were the Keys of that State; ſo that it is attributing to thoſe Fortreſſes what was owing to the imprudence of *Peter de Medicis* only.

Of all the ſeveral methods to preſerve a conqueſt, the moſt certain, the moſt humane, and the leaſt expenſive is that of Citadels. Weak as their garriſons may be, if they do but their duty, they may each of them keep one town in obedience. They are, in the firſt place out of the reach of conſpiracies, or of being any ways ſurpriz'd on the part of the inhabitants; it is not poſſible for thoſe people to riſe up in arms all at once, and form themſelves into a body, without the garriſon of the Citadel's being appris'd of it; and the inſtant they are ſo they are ſufficiently numerous to put a ſtop to their proceedings; for in the beginning of enterprizes of that kind people are apt to be diffident one of another, few care for taking the firſt ſtep, from an apprehenſion of being ill ſeconded, or perhaps deſerted by the reſt of their party, in caſe their firſt meaſures ſhould

* *Silhon, dans ſon Miniſtre d' Etat.*

prove

prove unſucceſsful, and one ſingle act of vigour on the part of the Citadel may effectually recall all the reſt to their duty. Had *Charles* of *Anjou*, after the conqueſt of the Kingdom of *Sicily*, built Citadels there, tho' he had left no more troops in them than barely ſufficient for their guard, the *Sicilians* had never dreamt of entering into that famous conſpiracy known by the name of the *Sicilian Veſpers*, or had they engaged in it, 'tis moſt certain they could never have proceeded ſo far as to cut the throats of eight thouſand people in two hours time.*

Philip of *Macedon*, the father of *Perſeus* held all *Greece* in ſubjection at a very ſmall expence, by means of the Citadel of *Corinth*, which made him call that Town and Citadel the fetters of *Greece*; ‡ had he choſe to have made uſe of a ſtanding army for the ſame intent, it would have required a very conſiderable one to have anſwer'd his purpoſe, and which could no otherwiſe have been maintained but by laying the people under very heavy contributions on the one part, and on the other hand he would have had reaſon to apprehend the inconveniences mention'd in the ſecond article of the preceding ſection.

Objection VII.

Citadels will not enable a Prince to reenter his own city which has revolted,

** if*

* An. 1282, *Mezeray*. ‡ *Plutarch* life of *Aratus*.

* ‘ *if any one ſhould object to me, ſaith* Machiavel, *that* Tarentum *of old was recover'd out of the hands of its rebellious ſubjects, by means of its Citadel, and that the ſame thing has happen'd juſt now with regard to* Breſt. *I ſhall anſwer him, that as for* Tarentum, Fabius Maximus *was ſent thither a year afterwards with the whole army, with which he would have been ſufficiently able to have retaken that city without the aſſiſtance of the Citadel, of whoſe aid, tho' he was willing to take the advantage, he could have fallen upon other meaſures with the ſame ſucceſs in caſe there had been no Citadel. Nor am I indeed perfectly well ſatisfied how far the Citadel was ſerviceable in the recovering of* Tarentum, *ſince they were obliged to ſend a Conſular army thither once again, under the command of the ſame* Fabius, *to aſſiſt in that work;*

* Diſc. Polit. book 11. chap. 24.

‘ *and*

'*and to make it manifeſt that the*
'Romans *would not have fail'd in*
'*their purpoſe of taking it without*
'*the Citadel, we need only remember*
'*the inſtance of* Capua, *which was*
'*effectually retaken altho' there was*
'*no Citadel.*

'*But let us come to* Breſt. *I ſay,*
'*it is an inſtance rarely to be ſeen*
'*what happen'd in that Rebellion;*
'*that at the ſame time the* French
'*were maſters of the Citadel they*
'*ſhould have ſo great an army in its*
'*neighbourhood; for Monſ.* De Foix,
'*General for the King, being at* Bou-
'logne *with all his forces, and there*
'*inform'd of the loſs of* Breſt, *with-*
'*out loſing one moment drew his for-*
'*ces towards that ſide, and having*
'*march'd thither in three days retook*
'*the town by means of the Citadel;*
'*in the mean while, in order to take*
'*this town, here is an evident neceſ-*
'*ſity for having beſide the Citadel*
'*ſuch a General as M.* De Foix,

'*with*

‘ *with a* French *army to ſuccour it in*
‘ *three days; ſo that this inſtance*
‘ *cannot defeat thoſe produced to prove*
‘ *the contrary.*

This argument of *Machiavel*'s is not much more juſt than the preceding ones.

Citadels are only built to ſave the great expence of maintaining ſuch a number of troops as would be neceſſary to reſtrain the inhabitants of a very populous town within their duty, it is notorious that the ordinary garriſon of a Citadel are but a trifle compared to the number of the inhabitants of the town; and when all of thoſe inhabitants have taken arms, form'd themſelves into a body, and put themſelves on their defence againſt the Citadel; thoſe of the latter cannot pretend to bring them to reaſon without a reinforcement, and that proportionable to the numbers the town contains, which may poſſibly amount ſo high, as to require an army to inſure the ſucceſs; the advantage of having a Citadel upon theſe occaſions is the keeping an opening to attack the town, ſuppoſing it poſſible for the ſuccours to arrive before the mutineers have time to fortify themſelves, or throw up works againſt the Citadel, as happen'd in the inſurrection of *Breſt* in the year 1512, and that of *Antwerp*, 1576; or in caſe they have had time enough ſo to do, and ſecured themſelves as effectually on that ſide as upon the reſt, the Citadel,

Citadel, if it commands the town as it ought to do, from the advantages of its ſituation, may greatly incommode the inhabitants in their defence, blocking them up cloſe on that ſide, and ſerving to contract the lines of Circumvallation and Contravallation of the beſieging army; ſo that 'tis with good reaſon affirm'd, that Citadels facilitate the meaſures of the Sovereign in reducing the ill-affected to obedience, and *Machiavel* improperly attributes to the army of ſuccours, thoſe honours which ought to have been ſhared betwixt them and the Citadel.

In the year **1640**, when the city of *Turin* revolted againſt the young Duke of *Savoy*, and Madame the Regent his mother; had there either been no Citadel in it, or the revolters made themſelves maſters of it, Count *Harcourt* would never have been able with thoſe few troops of his to reduce them under the obedience of their Sovereign; an infinity of examples, both ancient and modern might be produced to the ſame effect.

Objection VIII.

' * *When a Prince is once driven out of*
' *his Dominions, they prevent his ever*
' *returning. If, ſays* Machiavel, *you*
' *expect they ſhould be of ſervice to*
' *you in the recovering your loſt Domi-*

* Polit. Diſc. lib. 11. cap. 24.

' *nions,*

'*nions, you will never be able to ef-*
'*fect it, without an army to defeat*
'*that army which deſpoil'd you; and*
'*having ſuch an army you may reco-*
'*ver your Dominions, even tho' you*
'*have no Citadels, and which you will*
'*accompliſh with the greater eaſe, as*
'*you will have your own ſubjects at*
'*your devotion, which would not be*
'*the caſe had they been oppreſs'd by*
'*their means.*

'Guirbaldo *Duke d'*Urbin *the ſon*
'*of* Frederic, *who was a Great Gene-*
'*ral in his time, having been driven*
'*out of his Dominions by* Cæſar Bor-
'gia, *the ſon of Pope* Alexander VI.
'*no ſooner by an unexpected accident*
'*was he reſtor'd, but he inſtantly fell*
'*to razing all the ſtrong holds in his*
'*country, having experienc'd how pre-*
'*judicial they had been to him; for as*
'*he was belov'd of his ſubjects, he*
'*would have no barriers againſt them,*
'*and he found himſelf incapable of*
'*maintaining them againſt his enemies*

'*with-*

'*without a ſtrong army in the field*
'*beſide, to cover them from the army*
'*of the enemy, for which reaſon he took*
'*the reſolution to deſtroy them.*

'*Machiavel* likewiſe inſtances the
'behaviour of *the people of the town*
'*of* Bologna, *who having riſen in arms*
'*and made themſelves maſters of the*
'*Citadel which Pope* Julius II. *had*
'*built there, razed it forthwith.*

'He then adds, that Nicholas
'de Caſtello, *father of* Vitelli, *be-*
'*ing reſtored to his houſe, began im-*
'*mediately to demoliſh two Caſtles*
'*which* Sixtus IV. *had built there;*
'*becauſe he ſaw very plainly, that the*
'*affection of his people was ſufficient*
'*to maintain him in his Dominions;*
'*and that Citadels were ineffectual to*
'*that purpoſe.*

'He concludes with the exam-
'ple of Octavius Fregoſa, *who in*
'*the inſurrection of the* Genoeſe *a-*
'*gainſt* Louis XII. *having put him-*
'*ſelf at the head of the citizens, and*

'*made himself master of the Citadel*
'(*which the* French *had built there*)
'*by famine in sixteen months time,*
'*caus'd it to be razed.*

'*Any one would imagine,* says he,
'*that after what had happen'd he*
'*would have preserv'd it for a place*
'*of retreat upon occasion, but for his*
'*part, like a wise and prudent man he*
'*razed it, knowing very well that the*
'*affection of the subject is the defence*
'*of a state, not its Fortresses; and*
'*therefore not establishing his authority*
'*upon the basis of a Citadel but upon*
'*his own valour and good conduct, he*
'*preserv'd, and still preserves, the*
'*power he then acquired; and where-*
'*as a thousand foot soldiers were be-*
'*fore sufficient to have overturned the*
'Genoese *State, the enemies of* Fre-
'gosa *have attack'd him with ten*
'*thousand, and found themselves una-*
'*ble to hurt him.*

'*From this example then it mani-*
'*festly appears, that* Fregosa *did not*
'*hurt*

'*hurt himſelf by demoliſhing that Ci-*
'*tadel, and that the King of* France
'*did not mend his matters by building*
'*it; the meaning of which appears to*
'*be as follows; that Prince coming*
'*into* Italy *with an army, would have*
'*been able to have taken* Genoa,
'*notwithſtanding there had been a*
'*Citadel againſt him, but when he*
'*could bring no army he was not*
'*able to make himſelf maſter of*
'*the town tho' the Citadel was for*
'*him; the King therefore caus'd one to*
'*be built at a very great expence only*
'*to loſe it ſhamefully, and* Fregoſa
'*conquer'd it as gloriouſly and demo-*
'*liſh'd it as ſucceſsfully for his own*
'*affairs.*

The inſtances cited by *Machiavel* of Princes who have caus'd their Citadels to be demoliſh'd in order to facilitate their re-entrance into their dominions, in caſe they ſhould be driven out of them, have nothing to do in this place.

The Duke d'*Urbin* demoliſh'd his Fortreſſes becauſe being a very weak Prince he was not in a condition of defending them all himſelf; and he could find no ally willing to run the

hazard of giving him any aſſiſtance; of ſo little conſideration were he and his Fortreſſes. Beſides, this quotation of *Machiavel* is not juſt, if what *Guichardin* ſays is true, for in the firſt place he did not demoliſh all his Fortreſſes, he preſerv'd thoſe of *St. Leon* and of *Majuel.* *Secondly*, he did not demoliſh them immediately upon his return, but ſome time afterwards, when he found himſelf obliged to abandon his dominions the ſecond time. 'The Duke d'*Urbin*, ſaith that Hiſtorian, 'tho' the people who had promiſed him to lay down their lives for the preſervation and defence of his perſon beſought him not to leave them, knowing very well that the dangers he had reaſon to apprehend from the war were much greater than any ſecurity he could depend upon in the offers and aſſurances of his people, judg'd it moſt expedient to give way to the impetuous efforts of the enemy, and return'd himſelf to *Venice*, after having caus'd all the Fortreſſes in his dominions to be demoliſh'd, excepting thoſe of *St. Leon* and of *Majuel.*

There is likewiſe no ſort of conſequence to be drawn from the example of the people of the town of *Bolognia*, as it was the act of Rebels, who demoliſh'd a Fortreſs which had been built in oppoſition to themſelves, and to keep them in obedience.

Nicholas Caſtello, upon his return to his own country, demoliſh'd the two Caſtles which the Pope had caus'd to be built there for no other reaſon,

reaſon, but to prevent his people entertaining any jealouſy that he might one day take it in his head to make uſe of them againſt themſelves, and not with any view to facilitate his own re-entrance of his Dominions, in caſe he ſhould be driven out of them again, as *Machiavel* would have it underſtood.

The inſtance of the *Genoeſe* is more againſt than in favour of his opinion; had that Politician liv'd ſome few years longer, he would have been ſenſible of the very great miſtake committed by *Fregoſa*, in cauſing that Citadel to be demoliſh'd. When fortune has declared abſolutely againſt a Sovereign in war, if that power has any Fortreſs, thither he retires; from thence he may capitulate with the enemy, and obtain much better conditions than if the place of his retreat was not in a capacity of ſuſtaining a ſiege. *Fregoſa* having no longer a Citadel was obliged to ſurrender himſelf at diſcretion to the Marquiſs *de Peſcaire*, who ſent him priſoner to his own houſe, where he died ſoon after. Thoſe who are willing to excuſe him, ſay, that he depended upon the particular affection of the people of *Genoa*, and was apprehenſive his keeping up that Fortreſs, might have the appearance of tyranny and uſurpation in their eyes. The People's affection for their Prince can never be ſo great but a little caution in regard to them will always be neceſſary; and Sovereigns, who are really good men, ought to contemn the murmurings of the diſaffected, when ſuch a

reſolution is to be taken as is neceſſary for their own ſecurity.

In troubleſome times Citadels are not only uſeful to the Sovereign, but often to the people themſelves. *Appian* tells us, that the *Roman* army being exceedingly fatigu'd, *Scipio* was obliged to give fifty thouſand *Carthaginians* their lives, who had refuged themſelves in the Fortreſs of *Birſa*.

To what has already been ſaid in favour of Citadels may be added, that Citadels whoſe towns are without other defence, may ſerve as places of refuge for one part of the inhabitants, and prevent the enemies making a lodgment, or fortifying themſelves in the town; that after a battle loſt they may ſtop the advances of the conqueror, give the army time to rally, to receive a reinforcement, and to march afterwards to their relief, witneſs the Capitol which ſaved *Rome* after the loſs of the battle of *Allia* againſt the *Gauls*; by which means *Camillus* the Dictator had time to get the remains of the *Roman* army together, to wait the coming up of their allies, and came in time himſelf to its relief.

That when they are annexed to frontier towns that are fortified, they ſave the expence of maintaining a garriſon in thoſe towns in time of peace.

That when their towns are attack'd the Citadel obliges and forces the inhabitants to engage as far as poſſible in the defence of them.

That

That they ſerve as retrenchments, or places of retreat for the garriſon after the town is taken, which encourages the garriſon to puſh the defence of the town to the utmoſt, without fear of being at laſt made priſoners of war.

That Citadels, if well conſtructed, make the attack of their towns much more difficult, becauſe when thoſe fronts of the Citadel which are next the country are ſtronger than the works of the town, the beſiegers are put to it where to begin the attack; if they attack the town firſt, they will afterwards be obliged to make a ſecond ſiege of the Citadel, as was the caſe at the laſt ſiege of *Liſle* in *Flanders*; and if they begin with the Citadel, the fronts of it towards the country being ſtronger than the works of the town, and the beſieged having it in their power to retire into it with all their forces, it may by that means make a very vigorous reſiſtance, and give time for ſuccours to arrive, as has been often ſeen at ſieges, and laſtly was done at that of *Turin*.

Section III.

Wherein is concluded the Uſefulneſs and Neceſſity of Fortreſſes in general.

TO demonſtrate beyond all poſſibility of doubt that Fortreſſes of all kinds are uſeful and abſolutely neceſſary,

In the firſt place it cannot be diſputed that Princes in general, who are without defences of this kind againſt domeſtick enemies, are every moment liable to be expoſed upon the moſt trifling occaſions to the caprice of a reſtleſs, ignorant, factious multitude, never content and ever fond of novelty.

Secondly, It is no leſs certain, that if a Prince is weak, and has no places of ſtrength againſt foreign enemies, he will be of very little conſideration, and perpetually obliged to bear patiently endleſs inſults and encroachments offer'd him by his more powerful neighbours; whereas, if he has places of ſtrength and defence, and with them a reſolution like thoſe of *Mirandola*, *Monaco*, *Mantua*, and ſeveral others heretofore, he will be able to make head againſt them, there to defend himſelf and make good his ground till ſuch time as his neighbours, either jealous of the growing greatneſs of thoſe who attack him, or for ſome other reaſons of ſtate, ſend him ſufficient ſuccours to deliver him from thoſe dangers which otherwiſe muſt at laſt have overwhelm'd him.

It is likewiſe out of doubt, that Princes of a mean degree of power, ſuch as are not able to keep armies conſtantly on foot, have an abſolute need of Fortreſſes, without which they muſt be ſubject to continual fears and jealouſies with regard to Princes their powerful neighbours.

And as to Princes in a ſuperior degree of power, how formidable ſoever they may be on account of their armies, and being always in a condition to defend themſelves and to puniſh and revenge any inſults or injuries offer'd them by any other State, it is no leſs certain that Fortreſſes are extremely uſeful and advantageous to them, and ſometimes abſolutely neceſſary; for as their Dominions are enlarg'd their boundaries and frontiers become ſo too, and the expence of maintaining ſuch an army as would be neceſſary to guard them againſt ſurprizes, beſides other inconveniences, might be a charge too great for their revenues; they muſt therefore neceſſarily have recourſe to other means for that purpoſe, ſuch as Fortreſſes built upon their frontiers in the avenues of their Dominions, that an enemy may not have the leaſt hopes of ſucceſs in any attempt to force them till thoſe Fortreſſes are firſt taken. *Machiavel*, the Politician who has moſt ſtrongly declared againſt Fortreſſes, acknowledges, * 'that a 'Prince, even tho' he had good armies might 'nevertheleſs find his advantage in having 'places of ſtrength upon the skirts and fron-'tiers of his Dominions, as he would by their 'means be enabled to ſuſtain the enemy for 'ſome time, till all his forces were ready.' And a Prince, tho' he have no neighbouring State of equal power with himſelf, ought to be no

* Polit. Diſc. book 2. chap. 24.

leſs

leſs watchful over the ſecurity of his frontiers; becauſe ſeveral inferior Powers united in a Confederacy againſt him may be equally capable of hurting him; they may at the ſame time either ſeverally attack him in different places, or all together ſurround his Dominions on all ſides, and after making themſelves maſters of them, ſeize his perſon, or force him to abandon them; and immediately building Fortreſſes in the moſt advantageous and convenient places, and furniſhing them with all things neceſſary for their defence, put him out of any capacity of re-entering or recovering his Dominions; at leaſt force him into terms as little for his honour as his advantage.

If in regard to Princes we make another diſtinction, *viz.* of ſuch as become ſo either by Succeſſion, by Election, or by Power, that is to ſay, Conqueſt or Uſurpation; it is certain that the former, whether of a low, mean, or high degree of power, cannot diſpenſe with the want of Fortreſſes, as we have manifeſted already. That the ſecond ought not to be entirely without them. And, in regard to Princes of the third degree, they are abſolutely neceſſary.

Sovereigns in all ages, more or leſs, have made uſe of Fortreſſes. The *Greeks*, the *Romans*, the *Carthaginians*, had them; and, at preſent, there is not a Prince in *Europe*, either in a low, mean, or high degree of power, that is without them. The Pope, the Emperor, the

the King of *France*, the King of *Spain*, the King of *Portugal*, the King of *Sweden*, the King of *Denmark*, the States of *Holland*, the Seignory of *Venice*, and all the Princes of *Italy* have them, and are every day building new ones, according to the variable exigencies of their ſeveral States; even the Republick of *Poland*, who from the great natural ſtrength of her armies, ſhould ſeem leaſt to want them, hath Fortreſſes, two of which are eſteem'd impregnable; the firſt is that of *Witepski* in *Lithuania*, for her defence againſt the *Muſcovites*; the other that of *Caminiekz* in *Podolia*, againſt the *Turks*.

We ſhall conclude this chapter with ſaying thus much, and with great juſtice, in favour of Fortreſſes; that they are bucklers againſt a foreign enemy; bitts and bridles for a turbulent, ſeditious, or a conquer'd people; the ſecurity and preſervation of Provinces, the maintenance of States, the ſafety of Kingdoms and of Empires; the effectual means of procuring tranquility to the publick, by inſuring the power of the governors and the obedience of the govern'd; good order within, ſtrength without; that they are the characteriſticks of ſovereign authority, and that good policy directed Sovereigns to the uſe of them for the preſervation of their docks and ſhipping; laſtly, that they are the ſheet anchors of a State, which when the waves run ihgheſt, ſecure it from ſhipwreck.

CHAP.

CHAP. II.

Of the number of Fortreſſes neceſſary in a State.

ALTHO' we have made it evident that Fortreſſes are greatly advantageous, it doth not from thence follow that the greater number a State hath of them, the ſtronger it will become, or the difficulty of attacking it proportionably encreas'd. If ſome States have been loſt thro' the entire want of them, others have ſuffer'd greatly by having too many. *Italy* of old had never been ravaged by the *Goths* and others but for want of a certain number of places well fortified; and Hiſtory attributes one part of thoſe misfortunes which *France* underwent towards the middle of the fourteenth Century, to the great number of them at that time in the Kingdom. There was a Fortreſs almoſt at every land's end, the whole face of the country was cover'd with caſtles and ſtrong-holds; not only the cities but the market towns, and even little villages were fortified. **Mezeray* tells us in his abridgment of the hiſtory of *France*, that in thoſe calamitous times the ſmalleſt towns were fortified in ſuch a manner, as to ſtop the courſe of great armies; even

* Anno 1556.

villages

villages wall'd themſelves up againſt the incurſions of maroders; and that infinite number of caſtles ſerv'd only to prolong the war, and to devour the people by the robbers who lurk'd in thoſe holes.

The building and maintaining too great a number of Fortreſſes conſumes and devours the whole revenues of a State; in war they embezzle the means of ſending good armies into the field, by the vaſt expence requir'd to provide them with every thing neceſſary for their defence; and which if not done, the enemy attacks them and turns them againſt the Sovereign who built them. The great Prince of *Conde* one day asking Marſhal *Turenne* what meaſures he propoſed to take in the war in *Flanders*, the latter after acquainting him with his ſentiments, which were to engage the enemy frequently in battle, added, 'that if the 'King of *Spain* had employ'd that treaſure in 'raiſing and maintaining armies which he had 'expended in beſieging and fortifying towns, 'he would have been that day the greateſt King 'in Chriſtendom.

As the ſituation, extent, power and intereſt of a State can alone determine what number of Fortreſſes may be neceſſary againſt its foreign enemies, ſo the form and date of its government, the different ſects in religion, and the natural bent of the people, muſt regulate the number of them in regard to domeſtick ones.

SECTION

SECTION I.

Of the number of Fortreſſes neceſſary for the defence of a State againſt Foreign Enemies, according to its Situation.

THE Author of Nature not having thought proper to make the earth all of an even and equal ſurface, as he might if he pleas'd have done, but divided and diſpoſed of it into exceeding high mountains cleft and ſteep, into leſſer hills and vallies, into moraſſes, rivers, lakes and ſeas, into wide ſpreading foreſts and ſandy plains barren and deſert; ſeems in this diſpoſition to have had proviſional regard both to the health and well-being of mankind its inhabitants, and to have given ſome countries natural fortifications; for thoſe lofty and ſteep mountains what are they but high ſtrong walls which ſeparate different nations, protecting them reciprocally from being attack'd by each other, and affording them the means of living in ſafety and tranquility within their ſeveral boundaries; whilſt the vallies there may be conſider'd as ſo many channels of communication left for the ſake of commerce. Great moraſſes and large rivers ſeparate Kingdoms, and ſecure them from each other's ſudden attacks, in the ſame manner as wide lakes and wider ſeas; and thoſe rivers, lakes and ſeas beſides contri-

contributing to the ſecurity of the people, as they afford the means of intercourſe betwixt them, contribute likewiſe to their profit; wide foreſts and vaſt ſandy plains may be conſider'd as party-walls betwixt two great nations at war, to prevent their incurſions into each other's dominions.

On the other hand the great Architect of the Univerſe ſeems to have left to their own defence the inhabitants of the open plains, ſuch as are liable to be every where travers'd and over-run, affording no obſtacle to the invader, and whoſe eaſy entrance and abundant fertility ſeem to invite their neighbours to come and partake of thoſe gifts of nature, maugre the will of the poſſeſſors. After theſe reflections made it is eaſily to be ſeen, that all the various kinds of ſituations of States may be reduced into theſe three principal ones, that is to ſay, the ſtrong, the weak, and mean or mixt ſituations.

Firſt then a State may be ſaid to have a ſtrong ſituation, when the whole country is full of high mountains, where a ſmall body of men may oppoſe a great army every ſtep it advances; ſuch is the country of the *Suiſſe*, who would find impregnable retrenchments amongſt their mountains, if they came to be attack'd.

Secondly, When the country is all a moraſs, interſected with rivers and canals, which are natural fortifications capable of obſtructing and rendering abortive the efforts of the moſt powerful enemy; of this kind is almoſt the whole country

country of the States of the United Provinces. Theſe two ſituations of mountains and of moraſs are of all others the moſt advantageous, and one may with great juſtice affirm, have contributed as much to the eſtabliſhment of thoſe two famous Republicks, as the natural ſtrength and courage of the inhabitants.

Thirdly, When the whole country, except only the parts inhabited and their environs, is one continued foreſt, or uncultivated wild, ſuch is not the ſituation of any State in *Europe*, of any degree.

Fourthly, The ſituation of a State is ſtrong when one part of the country is high inacceſſible mountains, and the other moraſs, rivers, great lakes, and foreſt; ſuch is the ſituation of *Norway*, of *Ruſſia*, and of *Great Tartary*.

Fifthly, The ſituation may be ſaid to be ſtrong, when tho' the heart of the country be an even plain, the frontiers are of difficult acceſs; which ſometimes happens.

As firſt, when there is no approaching it but thro' narrow mountain-paſſes, ſuch as are naturally fortified and eaſily maintain'd and defended; there are no large dominions, and very few ſmaller ones which have frontiers of this kind on all ſides, but many that have them on one ſide or other of them; ſuch were the ſtraits of *Hermopylæ*, which form'd the paſs betwixt *Theſſaly* and *Greece*, where *Leonidas* took his ſtand with 4000 men, when *Xerxes* came with an innumerable army to conquer it.

Such

Such were of old the three entrance-paſſes into *Cilicia*, through one of which *Alexander* made his whole army paſs, and after contemplating the ſituation of thoſe parts, 'tis ſaid,* never was ſo amaz'd at his own good fortune as at that time, acknowledging that he might eaſily have been defeated, even by ſhowers of ſtones; for beſides that it was ſuch a defile as four armed men could ſcarce paſs a-breaſt, the upper part of the mountain overhung the path below, which was narrow and broken in many places by the fall of torrents from the mountains. Of this kind likewiſe are ſome parts of the *Pyrennees*, which ſeparate *France* and *Spain*; and almoſt all the *Alps*, which ſeparate the former from *Italy*.

Secondly, When ſuch a State is ſurrounded by the ſea, and 'tis exceeding difficult making a deſcent, being all a dangerous coaſt, no good roads or harbours, a great number of ſhelves and ſand-banks, and violent winds ordinarily blowing in thoſe parts. Such is *England*, which being ſever'd by the ocean from all other countries, is in no danger from any projects her enemies may form againſt her; in effect, we do not ſee in hiſtory any but the *Romans* and *Saxons* that could ever make a ſettlement there; and we have not for theſe many ages known any enterprizes againſt the *Engliſh* prove fortunate either to *France* or *Spain*.

* *Quint. Curt.* book 3.

In the reign of *Charles* VI. * ‘ the Council ‘ of *France* reſolv'd to attack them, not only ‘ in *Guienne* but in their own iſland; for which ‘ purpoſe the moſt formidable preparations ‘ were made both of men, ſhipping, and war- ‘ like machines that had ever been known; we ‘ bought, we hired all the ſhips we could lay ‘ our hands on between the ports of *Sweden* and ‘ *Flanders*, a City was built of wood in ſuch a ‘ manner as to be taken in pieces and put toge- ‘ ther again, intended to cover the troops on ‘ their firſt landing; the King himſelf went to ‘ *Sluys* harbour to view his armament, which ‘ conſiſted of nine hundred ſhips, and the whole ‘ being well appointed, had a moſt promiſing ‘ aſpect of ſucceſs. All that vaſt numerous ‘ army did nothing, part of them periſh'd at ‘ ſea, the reſt came back again to *France*.

* ‘ *Francis* I. finding himſelf unable to re- ‘ cover *Boulogne* from the *Engliſh* either by force ‘ or treaty, thought the moſt probable means ‘ of doing it would be to attack them in their ‘ own iſland. He order'd his galleys round by ‘ ſea from *Marſeilles* to the mouth of the *Seine*, ‘ he ſent for ten huge ſhips from *Genoa*, and ‘ order'd all thoſe in his own ports, which were ‘ fit for ſervice, to be got ready: Of this arma- ‘ ment Admiral *Annebaut* had the command, ‘ who ſail'd in queſt of the *Engliſh* army on ‘ their own coaſts, and firſt ſeiz'd upon the Iſle

* *Mezeray*, 1545.

‘ of

'of *Wight*. The *Engliſh* after ſome skirmiſh-
'ings retired into a place which had but one
'entrance, and was encompaſs'd with rocks
'and ſhelves all around, lying betwixt that
'iſland and *Portſmouth*; it was neither thought
'proper to fortify the Iſle of *Wight*, nor to at-
'tack them in a poſt ſo advantageous, but to
'make a deſcent upon their coaſts; this was
'done in three or four different places, and
'great outcries made at the ſame time, till the
'Admiral at laſt finding all was to no purpoſe,
'that the enemy would not appear, and his
'own proviſions were conſumed, put his helms
'about and ſteer'd for *France*.

In the year 1588 *Philip* II. King of *Spain*, ſent forth a moſt formidable naval armament, which he had equipp'd to conquer *England*; the *Spaniards* were ſeven whole years at work upon it, ſays *Mezeray*, and every year's labour coſt above a million of gold; that vaſt Armada, after being toſs'd and buffetted, and diſpers'd on all ſides, firſt by a continual tempeſt, and afterwards by the *Engliſh* and *Dutch*, and after loſing near ten thouſand men and above ſixty ſhips, made a ſhift with the utmoſt difficulty, in a moſt forlorn and tatter'd condition to get into the harbours of *Spain* again. This was the fineſt Fleet the Kings of *Spain* had ever put to ſea.

Theſe three inſtances are ſufficient to ſhow the ſtrength of a great State encompaſs'd by the ſea, and that ſuch have more to fear from

their domeſtick than foreign enemies; the latter of which can hardly ever hope to ſucceed in any attempts upon them, without the concurrence and aſſiſtance of the former.

Thirdly, The Frontiers of a State are difficult of acceſs when it is ſurrounded on all ſides by rivers extremely wide and rapid, or by great lakes, or large and deep moraſſes.

Fourthly, When it is bounded either by foreſts of a great extent, or by vaſt deſarts dry and barren; this kind of ſituation and the preceding one are very rare, there being none ſuch in *Europe*.

Fifthly, When a State is barr'd by high ſteep mountains on one ſide, and ſurrounded by the ſea on all the reſt, as ancient *Greece* was, and as *Spain* and *Italy* are at preſent.

Sixthly, When a State has for its Frontiers, on one ſide, exceeding lofty and ſteep mountains, like the *Alps* and *Pyrennees*; ſome of its other parts bounded by the ſea, and on the reſt a great river: Such would be the ſituation of *France* if it had the *Rhine* for its boundary on the ſide of *Germany* and *Holland*.

Laſtly, The frontiers of a State are difficult of acceſs whether conſiſting entirely of one of thoſe kinds of countries we have already deſcribed as difficult to be traverſed, in regard to the ſmall numbers required to oppoſe the traverſers, or where ſeveral of thoſe kinds are intermingled one with the other; which is to be met with in ſome States.

The

The advantages are very great of ſtrong ſituations, being a kind of natural fortifications, built without trouble or expence, of proof againſt the inſults of an enemy, or the injuries of time itſelf. Amongſt the ſeveral cauſes aſſign'd by *Strabo* for the growing greatneſs of the *Roman* Empire, he gives the firſt place to the following one; that it was eaſy for the *Romans* to be always in a capacity of repelling the attacks of their enemies, as *Italy* having almoſt the form of an iſland was every where ſurrounded by the ſea excepting that part only where it join'd the Continent; which was but of a ſmall extent, and that barricaded by the *Alps*, lofty and inacceſſible mountains, which ſerv'd it for ramparts and walls, and other artificial fortifications.

A very few Fortreſſes are ſufficient where States are ſituate in the manner we are now ſpeaking of, but ſome will always be neceſſary, becauſe *'they who confiding too much in 'thoſe natural advantages have lull'd them-'ſelves aſleep, and neglected other defences, 'have found themſelves deceiv'd and ruin'd by 'the very means they imagin'd themſelves ſe-'cured.' Mountain-paſſes, how difficult ſoever, may be ſurpriz'd or forc'd; the making a deſcent upon an iſland is far from an impracticable thing; rivers, lakes and moraſſes may all be paſs'd, if not of a very great extent, under fa-

* *Rohan parfait Cap.* chap. 19.

vour of a numerous artillery; the thickeſt woods and foreſts, and wideſt deſerts may be croſs'd. The number of Fortreſſes neceſſary muſt be determin'd by the number of Paſſes eaſy or practicable.

A State is of a weak and diſadvantageous ſituation, when it has open plains on all ſides, and no conſiderable rivers either to bound or interſect them, or other difficult paſſes. States ſo ſituated require a great many Fortreſſes for their ſecurity and defence; if they are of a large extent, and their Sovereign a powerful Prince, a double chain of them at leaſt will be neceſſary to ſecure their frontiers; that if he ſhould happen to receive a check in attempting to ſuccour any of the firſt line, thoſe of the ſecond may ſtop the victorious and give the vanquiſh'd time to form a ſecond army. The ſecond chain ought not to be above eight or ten leagues behind the firſt, and the places of the firſt not above ſix or ſeven leagues at moſt diſtant from one another, as thoſe of the ſecond ſhould be; and the latter oppoſite to the center of the foremoſt intervals, or as near it as poſſible; that in caſe the enemy ſhould attempt to penetrate without attacking any of the firſt chain, thoſe of the ſecond by ſuch diſpoſition may prevent his drawing any ſubſiſtence for his army from the country about them.

This rule for the proper diſpoſition of Fortreſſes on the frontiers of an open State has one exception. If there is any where a river or navigable

vigable canal, by means of which the enemy may bring all ſorts of neceſſaries for their army's ſubſiſtence, while he is attacking the places on the frontier, or even after he ſhall have penetrated into the country: 'Tis on the ſide of this river or canal where the fortreſs of the firſt and ſecond line muſt abſolutely be placed, even tho' it ſhould occaſion the leaving a greater diſtance betwixt themſelves and the fortreſs upon the right and left of them, than what we have juſt now preſcribed; becauſe thoſe rivers and canals affording eaſy opportunities of tranſporting proviſions and ammunition, greatly contribute to the ſucceſs of all undertakings in war.

We call that a mean or mixt ſituation of a State, ſome parts of whoſe frontiers are open plains without any obſtacle to the paſſing them, and whoſe other parts are barr'd by ſteep mountains, or encloſed by the ſea, or great rivers, lakes, or moraſſes, or by woods or foreſts of a great extent; theſe are the moſt ordinary ſituations of States, nature having been pleas'd to vary the ſeveral parts of the ſurface of the earth. The number of Fortreſſes neceſſary on each ſide of the frontiers muſt depend upon their ſituation; that is to ſay, where the approaches are naturally difficult a few may be ſufficient; where they are eaſy, many will be wanting.

SECTION II.

Of the number of Fortreſſes neceſſary for the defence of a State againſt foreign Enemies, according to the extent and power of the State.

DOminions of the greateſt extent, and whoſe Sovereigns are powerful in the higheſt degree, ſuch as the *Roman* Empire was of old, and that of the *Turks* is at this day, in the judgment of ſome Politicians require but a few Fortreſſes; becauſe as they can afford to keep great armies on foot, they may preſerve their Country by only keeping the field.

This way of thinking is not ſo much the reſult of juſt reflection as of prejudice in favour of the example of the *Romans*, who as hiſtorians tell us had but a few Fortreſſes, and of the *Turks* who have not many, and thoſe only in the paſſes of greateſt importance; if we examine this point with attention and without prejudice, we ſhall find, at leaſt in my way of thinking, that it would be much more for the advantage of the ſeveral States to regulate the number of their Fortreſſes according to the circumſtances of their own ſituation.

Had *Darius*, whom we may place in the liſt of the moſt powerful Princes ever yet known, whether we conſider his riches or the extent

and

and fertility of his Dominions, had more than one chain of good Fortreſſes to oppoſe the firſt heat and impetuous violence of *Alexander*, the latter might perhaps have ſeen his whole army deſtroy'd as well as the new levies he ſent for out of his own Kingdom, before he had been able by forcing the laſt chain to open himſelf a paſſage into the heart of his adverſary's dominions. The advantage gained over an enemy by the taking one of his towns is a limited victory, while other towns are ſtill behind; whereas that of a battle fought and won on the ſhorne ground, if compleat, has no bounds while the conqueror knows but how to avail himſelf of his advantage; and if he is active, vigilant, and enterprizing, as hiſtorians paint *Alexander*, 'tis certain the vanquiſh'd will ſcarce have time to recover his firſt aſtoniſhment, to look about him and make the beſt uſe of the reſources which may be ſtill left him. The loſs of a battle has a different effect on the ſpirits of the people from the loſs of a town, when they know there are more behind to ſtop the enemy; in the latter misfortune the alarm is not general, it reaches no farther than that part of the frontier attack'd, and ſerves only to awaken the zeal of the affectionate part of the ſubjects to aſſiſt their Sovereign; the ill-affected durſt not ſhow their heads on ſuch an occaſion; but after a battle loſt upon an open frontier, the terror ſpreads and reaches the moſt diſtant, ſtaggers the conſtancy

ſtancy of the beſt affected, and perſuades the malecontents then is their time to declare.

As to Dominions of a great extent and power, ſuch as the Empire, *France*, *Spain*, *&c.* there is no doubt to be made but the number of their Fortreſſes ought to be determin'd by their ſituation; that is to ſay, by the quality of the country which compoſes the ſeveral parts of their frontiers.

States in a mean degree of extent and power ought to regulate the number of their Fortreſſes after ſuch a manner, that the troops they are able to raiſe and maintain in caſe of a war, may be ſufficient to guard and garriſon their towns and defences, and at the ſame time form a body of an army to keep the field; both theſe purpoſes muſt be provided for, in order to defend ſuch a State, becauſe * 'an army where there 'are no Fortreſſes durſt hazard nothing, but muſt 'ſhut themſelves up in their camp, leaving to 'the enemy the foraging of the country, and 'means of ſubſiſting at your expence, and at 'laſt to your ruin: On the other hand, For-'treſſes where there is no army can protect 'you no longer than till the magazines of fo-'rage you have laid up there are conſumed; 'but when proper regard has been had to both 'theſe particulars, ſuch a State is capable of 'making a great reſiſtance.

* *Rohan parf. Cap.*

'Tis

'Tis equally dangerous for a State to have more Fortreſſes than it can maintain, and to have none at all; of the two I ſhould chuſe the latter, becauſe in risking a battle you make the enemy partake of the danger, whereas the other way you are ſure to be undone, without other hope than that of protracting your ruin; for the deſire of preſerving all your Fortreſſes by putting ſtrong garriſons into them, deprives you of the means of keeping an army in the field, till after loſing two or three harveſts by pillage, you are obliged to take it tho' with a halter about your neck. I know there are ſome of a contrary opinion, who go upon this maxim, that when all the principal places of a State are fortified, the whole forage and proviſion of the country may there be laid up; where if an army of the enemy comes, and continues any time they muſt ſtarve; if they only march thro', the damage they do cannot be great, ſo that 'tis almoſt impoſſible for them to undertake any conſiderable ſiege.' To this I anſwer, that the chief intent of Fortreſſes is the defence of the weaker ſide, to enable a few to reſiſt a ſuperior number, that if you have ſuch a number of them, and ſufficient garriſons for them and all your large fortified towns beſides, you muſt have a greater number of troops than your enemy can bring againſt you, ſuppoſing, I ſay, each of them ſufficiently garriſon'd to maintain a ſiege; and if you are ſtronger than your enemy,

enemy, of what uſe are your Fortreſſes, when you may preſerve your country by only keeping the field? From all which I draw this concluſion, that the number of your Fortreſſes ſhould be limited, and ſo few as to be no obſtacle to your keeping the field.

Many Generals of armies have preſerv'd their country when invaded by purſuing this maxim, and others loſt theirs by the neglect of it. When *Piedmont* was attack'd the Prince of *Melphe*, General of the *French* army, not having a ſufficient number of troops to garriſon all his Fortreſſes, and keep an army in the field beſides, caus'd all the forts and fortified places of leaſt importance, which lay round thoſe principal ones he thought himſelf in a condition of maintaining, to be demoliſh'd; and that wiſe conduct proved the means of ſaving and preſerving the State. On the other hand, in the war of *Sienna* the *French* Generals, from a deſire of maintaining too great a number of forts and caſtles, were at laſt obliged to abandon the *Tuſcan*; their forces being ſo reduced and weakened, as to be no longer in a condition either of affording them ſuccours, or of attempting to recover them; and the leaſt of thoſe forts when loſt aſſiſted the enemy in the conqueſt of the more important. In the year 1673 *Louis* XIV. tho' the moſt powerful Prince in *Europe*, abandon'd the greateſt part of his conqueſts in *Holland*, withdrawing his garriſons from thence in order to augment his army.

Weak

Weak States, in the judgment of all Politicians, ought not to have more than one or two Fortreſſes, but thoſe exceeding well fortified, and furniſh'd with proviſions, arms, men, and warlike ſtores, as well as a ſufficient quantity of money; that they may be enabled by making a long defence to give time for thoſe to come to your aſſiſtance who would not willingly ſee the aggrandiſement of that power which attacks you: '* For without you have ſome means of 'reſiſtance, your country muſt be loſt before 'any can have time to come to your relief; 'and beſides that the facility with which you 'are to be conquer'd may tempt the enemy to 'invade, you will find your allies better diſ-'poſed to ſuccour you while you are in poſſeſ-'ſion of your dominions, than to aſſiſt you in 'the recovering them when loſt; as one is 'eaſy with an equal force, the other extremely 'difficult, without a great ſuperiority: To 'which I ſhall add, that the danger is often-'times as great of your auxiliary retaining 'thoſe dominions to himſelf, as of their being 'conquer'd by the enemy; or if he reſtores 'them, it may be upon ſuch hard conditions, 'that little more than the ſhadow of Sove-'reignty may be left the poſſeſſor. Happy are 'thoſe Princes who meet with ſuch diſinte-'reſted and generous allies, as to re-eſtabliſh 'them in their own loſt dominions, in the

* *Parf. Cap.* chap. 19.

'ſame

ſame power and independency they before poſſeſs'd, for the examples are but few.

When a State weak in itſelf is of difficult acceſs, as when guarded by ſome mountain-paſs, or by ſome great river, lake, or moraſs, paſſable only in one or two places, and where a few ſmall forts may diſpute the paſſage, and perhaps hope to repel the enemy; as the charge of their conſtruction and maintenance cannot be very great, and they require a very few to guard and defend them, it would be extremely proper for the ſecurity of ſuch States to build a fort at each of thoſe paſſes.

If ſuch a State were ſurrounded by the ſea, that is to ſay, were an Iſland like *Malta*, and had few places where a deſcent could poſſibly be made, and even there to be oppoſed with great advantage on the part of the inhabitants, of whom there was a ſufficient number for that purpoſe; and in caſe they ſhould be overpower'd at laſt, an aſſured retreat into their Fortreſs, without danger of being cut off; it would be extremely proper to build ſmall forts or redoubts, and batteries encloſed on all ſides at each of thoſe places, under the protection of whoſe fires they might effectually oppoſe the enemy's paſſage and deſcent, and oblige them to begin their attempt by making themſelves maſters of thoſe forts.

The deſcent in that caſe would be extremely difficult to effect, as the reſiſtance made by thoſe works would give time for the whole iſland

iſland to rendezvous before the enemy could be compleatly debark'd; and who with the aſſiſtance of the forts, *&c.* before-mention'd, would be able to engage with advantage thoſe already landed, whatever their numbers might be.

Theſe were the reaſons which in the year 1715 determined the Prince of *Vendoſme*, then great Prior of *France*, to order works of this kind to be built on the coaſts of the Iſle of *Malta*, in thoſe places wherever there was a poſſibility for a deſcent to ſucceed.

Where the circumſtances above-mention'd concur, no ſort of inconvenience but infinite advantages muſt enſue from the purſuit of ſuch meaſures: The worſt that can happen is the being overpower'd in your endeavours to oppoſe the deſcent; in which caſe it not being in the enemies power (as we have ſuppos'd) to cut off your retreat, you have only to retire into your Fortreſs, and from thence to make your defence in the ſame manner as if you had there expected the firſt coming of the enemy. If you have the good fortune to repulſe them, you prevent the ravaging of your country, the beſieging of your towns, and perhaps the loſs of your whole State.

Give me leave to obſerve here, that the engaging in oppoſition to a deſcent, by means of a place well fortified, is not an indifferent action like that of defending one'ſelf in a town where one happens to be ſhut up, but neceſſarily preſuppoſes ſomething more than an ordi-

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nary degree of valour, which cannot but in ſome meaſure ſtrike an awe into the aſſailants, as well as greatly raiſe the ſpirits of your own people; not to mention that deſcents have always been look'd upon as the moſt difficult of all warlike enterprizes, and of the moſt doubtful ſucceſs; the making the neceſſary diſpoſitions for them is ſo tedious a work, and after a great deal of time ſpent when you are juſt upon the point of coming to action, ſometimes a gale of wind ariſes, which inſtead of favouring your purpoſe, obliges you at once to caſt about for your own preſervation, to avoid being wreck'd on that coaſt you were juſt before preparing to invade.

The Generals of the expedition can have no knowledge of the ground where the deſcent is to be made, but from the report of ſuch countrymen as are in the army; and it very rarely happens, that people quite ignorant in affairs of that kind can give ſufficient lights for forming a judgment of the right ſpot where the deſcent ought to be made; we know that for a little money they will affirm what they never ſaw; that there is no ſuch thing as depending on them, and ſometimes the leaſt change of circumſtance, or ſtarting of an unexpected obſtacle throws a damp upon the whole, and the deſign is dropt on the very brink of ſucceſs; the difficulty of making a retreat is a check on the ſoldier's valour, and in the time of making the deſcent, if the leaſt party of the enemy appear

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they grow quite diſhearten'd. The boats ſhould keep cloſe to one another, in order to land all at the ſame time, in which diſpoſition 'tis impoſſible but many muſt be broken by the cannon firing upon them from juſt at hand; and wherever this happens, 'tis ſo many men loſt to the combat, for as every boat is as full as it can hold, none can take them in; all the chance therefore left them for their lives is quitting their arms to endeavour to ſwim a-ſhore, in which caſe thoſe who are any ways diſabled by their wounds muſt periſh in the water.

I have heard it ſaid by ſeveral officers who were in the expedition made in that war which ended with the treaty of *Ryſwick* in 1697, to reduce to their obedience the inhabitants of a ſmall Iſland who had revolted; that had thoſe people inſtead of ſhutting themſelves up in their capital, offer'd to have oppos'd the deſcent in any ſhow of reſiſtance, the former would have been hard put to it to have forc'd them; the fleet having met with a ſtorm at ſea which had diſpers'd their ſhips, of which ſeveral had periſh'd. The ſoldiers were ſo fatigu'd with their paſſage, that they were almoſt incapable of acting, they were ſo haraſs'd and ſo weak as to require ſome time aſhore to ſet them on their legs again; thoſe who had undertaken to be the guides were quite out of their knowledge, inſomuch they might have been extremely embarraſs'd in making their diſpoſition, but that they found the Iſlanders had forſaken the coaſt.

'Tis quite otherwiſe with thoſe on the defenſive; when the enemy is come and the deſcent is to be oppoſed, themſelves know the ſtrong and weak parts of their coaſt, and make their own diſpoſition accordingly; wherever the appearance of the enemy ſeems to point their deſign, while they are preparing for that purpoſe, the former have time to fortify the part in danger, to march all their troops thither, and in drawing them up to take the beſt advantage of the ground: If it was a feint only of the enemy, who after ſhowing himſelf off the coaſt ſail'd away to ſome other part of the Iſland, the Iſlanders may inſtantly be advertis'd of it by ſignals, and reach the place of his intended attempt as ſoon as himſelf; or ſhould they come ſomething later, the entire debarkment of an enemies troops, in oppoſition to the fire of ſuch forts as we have mention'd, is a work of ſo long a time that the number as yet landed muſt needs be very inferior to the whole body of the Iſlanders aſſembled and united on ſuch an occaſion.

If the having too great a number of Fortreſſes is ever inconvenient, 'tis particularly ſo in the caſe we are now ſpeaking of; for inſtance, ſuppoſing we ſhould increaſe the number of thoſe built by Monſ. the Prince of *Vendoſme*'s order on the coaſts of the Iſle of *Malta*, inſtead of obſtructing any deſcent they would greatly contribute to its ſucceſs; for at the time of an invaſion thoſe ſmall Fortreſſes muſt none

none of them be without their garriſons, by which means the greater number there is of them, the weaker will become your *Corps de reſerve*, on which corps is your chief dependance for repelling the invaders; and if you neglect ſuccouring thoſe forts, and leave them to their own defence, they muſt ſoon fall into the enemy's hands: They are ſtrictly ſpeaking no other than *Corps de Gardes*, with a retrenchment around them, to enable thoſe within to make a ſtand againſt invaders, to find them employment, and obſtruct their debarking, till the *Corps de reſerve* have time to come up; 'tis therefore fit their dimenſions be proportion'd to the ſtrength of ſuch garriſons as can be afforded them, if the Iſland ſhould be attack'd; in which caſe, the making them too large would be a uſeleſs expence.

When an Iſland is of a very ſmall extent, has few places where a deſcent can be commodiouſly made, and the remaining parts of the coaſt eaſily made inacceſſible; when all the materials neceſſary for fortifying thoſe parts where there is a poſſibility of an enemy's making a deſcent and penetrating, are to be found upon the ſpot; in ſuch a caſe it ſeems rather adviſeable, for the reaſons already given, to endeavour to fortify the whole coaſt, and make as I may ſay, one large fortification of the whole Iſland than ſeveral, or as uſual, one in every part of it; for a ſingle line thrown up is a ſufficient defence againſt a deſcent, tho' not capable

of any great reſiſtance againſt a land-attack, unleſs accompanied with baſtions, ravelins, counter-guards, ditches, cover'd ways, and ſeveral outworks not to be made without a very great expence. So that when an Iſland is ſmall, and partly inacceſſible, as we have ſuppos'd, the charge will certainly be leſs to throw up a line before the acceſſible parts, than to make ſuch Fortreſſes there as may contain all the inhabitants of the Iſland.

Had this courſe been taken at firſt with *Malta*, I am perſuaded ſuch a line would have been attended with leſs expence than the ſeveral fortifications of that place have been.

Section III.

Of the number of Fortreſſes neceſſary according to the Intereſt of the State.

THE Intereſt of the State is likewiſe to be conſider'd, in order to determine what number of Fortreſſes may be neceſſary on each ſide of its frontier.

When a State has any pretenſions upon another State its neighbour, 'tis a ſufficient reaſon for the latter to ſpare no expence in fortifying that part of his frontier adjoining to his neighbour's territories, by building as many Fortreſſes as may be effectual for his ſecurity and defence.

If any part of a Sovereign's frontier lies extremely convenient for one of his neighbours, 'tis another reaſon equally ſtrong for declining no expence neceſſary to put it in a condition of defence, by making a ſufficient number of ſtrong holds there; for amongſt Princes ſometimes the claim of convenience is look'd upon as juſt as that of ſucceſſion.

When two neighbouring States have no kind of pretenſions one upon the other, and that it is equally the intereſt of either that the power of both be preſerv'd and maintain'd within its proper limits, the conſtructing a great number of very ſtrong places on their frontiers would be a fruitleſs expence on both ſides.

This is the caſe betwixt the *French* nation and thoſe of *Switzerland*; if the latter are a people jealous of their liberty they cannot be ſo of *France*, who has not the leaſt pretenſion to the Cantons, and who is even concern'd in intereſt that their government ſhould not be chang'd, nor any attempt form'd againſt their liberties by any perſon whatſoever, to preſerve that Republick for her impregnable Barrier on that ſide: Beſides, if *France* were even able to conquer them, and reduce them to her own ſubjection, ſhe muſt falſify her own intereſt ſo to do; as ſhe could no longer put any confidence in the people of that nation, who now come moſt ready voluntiers into her ſervice; and ſhe muſt beſides make uſe of her whole force to preſerve her conqueſt of thoſe barren

mountains, from whence ſhe could eternally hope to reap no other fruit than the bare honour of their dominion; and that very dearly purchaſed.

On the other hand, *France* can have nothing to apprehend from *Switzerland*, who is equally concern'd in intereſt to ſupport the *French* monarchy againſt all her enemies, that her preſent power may continue, and ſhe always in a capacity of paying well for the troops furniſh'd her by that country, as well as themſelves receive ſuccours from her in caſe of any attempt made upon their own government. Indeed, if *France* and the Empire ſhould ever happen to be in the ſame intereſt, the caſe would be much alter'd.

SECTION IV.

Of the number of Fortreſſes neceſſary in regard to the Domeſtick Enemies of a State, according to its form of Government.

ONE of the greateſt misfortunes which can happen to a State, is the falling under the power of its neighbour, or changing its own form of government; Fortreſſes, as we have made it evident, are one of the principal means of preventing either: In the three foregoing

going Sections we have ſhow'd what number of them are neceſſary for remedying the firſt of theſe evils; we now proceed to ſhow in this and the following Sections, what number of them may be requiſite to prevent the ſecond.

Politicians make ſix forms of government, three ſimple and three compounded.

The three ſimple are Monarchy, as *France*, *Spain*, *&c.* Ariſtocracy, as *Venice*, *Genoa*, and ſome of the *Swiſſe* Cantons; and Democracy, as *Athens* of old, before and after the tyranny of *Piſiſtrates*, and the Cantons of *Baſil*, *Ury*, *&c.*

The three compounded forms of government are Ariſto-monarchy, as *Poland*; Ariſto-democracy, as *Rome* was formerly after the eſtabliſhment of the Tribunes, and the Cantons of *Zurich* and *Schaffhauſe*; and Monariſto-democracy, as *Great-Britain* and *Sweden*; which latter upon the death of *Charles* XII. reſumed their ancient form of government, very much as they pretend to their advantage.

Of theſe ſix kinds of government Monarchy and Ariſtocracy have occaſion for the greateſt number of Citadels. The extraordinary expences of a Kingdom are very great, eſpecially in time of war; to provide funds for thoſe occaſions a King often finds himſelf under a neceſſity of encreaſing his taxes, which is never done without ſome murmurings againſt the government: Beſides, the Prince having the nomination to all poſts either of truſt or dignity, and the diſtribution of all favours, it is impoſ-

ſible, let him govern as he pleaſes, but he muſt make ſome malecontents; amongſt thoſe who happen not to partake of them, there is not one who doth not think himſelf injur'd, from an opinion of his own merit, the common weakneſs of mankind; theſe kind of people deſire nothing ſo much as a diſturbance in the State, hoping under ſuch circumſtances to have an opportunity of revenging themſelves for their imaginary wrongs; of theſe the moſt ambitious and profligate have ſcarce patience to expect the occaſion, but haſten and promote it by all means in their power, by ſlandering, calumniating and abuſing the government, in order to irritate and exaſperate the minds of the people againſt it, till at laſt if not reſtrain'd by fear they break into open rebellion.

This evil is ſtill more to be apprehended in an Ariſtocratical government, becauſe, beſides the inconveniencies above-mention'd, it is expoſed to the attempts of a people excluded all places of truſt, who muſt either be gratified in their demands, or reſtrain'd by force, witneſs all the diſorders which happen'd in *Rome* before the eſtabliſhment of the Tribunes.

In theſe two kinds of government there is a neceſſity for having a Citadel, Fort, or Caſtle in their ſeveral Capitals, and in all their large open towns, and ſometimes more than one, according to the extent of thoſe places: In large fortified towns Citadels are abſolutely neceſſary, for without them their fortifications only put it

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in the people's heads to revolt, finding themſelves ready prepar'd to ſtand upon their own defence.

But above all, fortified maritime towns have the greateſt need of Citadels, the eaſe with which they may be ſuccour'd by an enemy, frequently tempts them to revolt; and being beſides uſually full of ſtrangers, who reſort thither on account of commerce, they are more eaſily to be ſurpris'd than other towns, and may at laſt ſerve to let an enemy into the Kingdom.

As to Democratical States, where the equality of the ſubject and every one's expectation of obtaining employments in their turn, may reaſonably preſerve all in union and amity, they have no occaſion for Citadels; 'twould be a kind of violation of their natural rights to make them, and might very well beget a jealouſy that thoſe who had the reins of government in their hands, had form'd ſome deſign upon the others liberties: The ſtrength of ſuch States principally conſiſts in the harmony amongſt the ſeveral members that compoſe it; and ſo evident a mark given of diſtruſt and diffidence in one of the parties, would be the deſtruction of that good intelligence.

The caſe is the ſame in Ariſto-democratical States, where the Nobles and the People having each their ſhare in the government, the building Fortreſſes might create a fear in the latter, leaſt the grandees ſhould make uſe of them to the diſpoſſeſſing the others of their authority.

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All Republicks whatſoever have need of greater precautions againſt thoſe who have no ſhare in the government, than a King has occaſion for in regard to his people; therefore, if theſe two kinds of States we are now ſpeaking of ſhould have many large cities in their ſubjection, there is a neceſſity for their having Citadels to keep the inhabitants to their duty.

This was the practice of the *Athenians*, who had Citadels in all their great towns; and the *Romans* follow'd the ſame maxim, as already has been ſaid.

In Ariſto-monarchical States, if the Kingdom is hereditary, the Capitals muſt have a Citadel, and all the reſt of the great towns whether open or fortified; but if the Kingdom is elective, all Politicians agree, there ought to be very few, if any, leaſt the King ſhould make uſe of them as inſtruments for changing the courſe of ſucceſſion, by making the King-ſhip hereditary in his own family. In the greateſt cities in *Poland* we ſee no other Caſtles than ſuch as are ſurrounded with a wall only, after the antient manner.

Politicians are likewiſe againſt the uſe of Citadels in a Monariſto-democratical State, becauſe the King, Nobles, and People having each their proper department in the publick authority, and each of theſe Powers having an eye one upon the other, Citadels might be prejudicial to that confidence which the People ought to maintain both in regard to the Nobles and their Sovereign.

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In theſe laſt States, in Democracies and Ariſto-democracies, it is indiſputably certain, that in regard to their form of government they ought to have no Citadels; and that they are directly oppoſite to the nature of their eſtabliſhment, nevertheleſs ſuch circumſtances may concur as to make them abſolutely neceſſary; which ſhall be ſhown in the following Section.

Section V.

Of the number of Fortreſſes that may be neceſſary, according to the date of the eſtabliſh'd Government between Sovereign and People; their different opinions in Religion, the natural diſpoſition of the people, and their zeal for the Sovereign and the State.

IN order to determine what number of Fortreſſes may be neceſſary in a State, the date of the preſent eſtabliſhment betwixt the Sovereign and People, their different ſects in Religion, the natural diſpoſition of the people, and their zeal for the State and Sovereign, are much more to be conſider'd than the form of government itſelf.

If that form of government is a recent one, the ſame in all reſpects as at firſt and in high eſteem

eſteem with the people; the newneſs of its date is a ſufficient reaſon for building a Citadel in its Capital, and great towns. Men are naturally fickle and inconſtant; no ſooner have they obtain'd what they earneſtly deſired, but they grow diſguſted again, and regret the exchange from their former condition. When *Rome* had expell'd *Tarquin*, he was ſcarce out of the city before they wanted to recall him. When the Ariſtocratical was chang'd to an Ariſto-democratical form of government, many were found to whom the new form was diſpleaſing, and the Ariſto-democracy being ſupplanted by the Monarchical State, an infinite number of conſpiracies were ſet on foot to reſtore the former government; the ſame thing happens in all revolutions of States.

In Monarchical States, if the Sovereignty is but newly acquired, that is reaſon ſufficient for increaſing the number of Citadels; or if any part of the people are but lately become ſubjects, whether it be by conqueſt, ſucceſſion, or purchaſe; but eſpecially if any pretenders are left.

Different ſentiments in Religion is a circumſtance to be regarded. Nothing ſets a people ſo much at variance amongſt themſelves as different opinions, or even the uſe of different ceremonies in matters of Religion; if there ſhould be two ſects only, and that of the government the ſtrongeſt and moſt numerous, there will be a neceſſity nevertheleſs for having always

always a number of Citadels, to reſtrain the inſolence of that party, who under the pretext of religion would make attempts againſt the State. If there happen to be many ſects, and every particular ſect very much inferior in point of numbers to all the reſt in general, there is leſs danger to be apprehended than where the different ſects were but two, and thoſe nearly of equal numbers; becauſe in the former caſe, if any one of them ſhould make an attempt againſt the State, all the reſt would join with the Sovereign to oppoſe the innovation.

'Twas for this reaſon, as it is ſaid,* that the Kings of *Egypt* encourag'd ſuch a variety of religions in their Kingdom heretofore, to prevent their ſubjects uniting to oppoſe the evil adminiſtration of the government; for it is an eaſier matter to adjuſt the different intereſts of ſeveral people, than to reconcile them in their religious ſentiments; and without this latter no union can ſubſiſt for any time, without fears and jealouſies one of the other.

The temper and diſpoſition of the people is likewiſe a circumſtance greatly to be conſider'd in regulating the number of Citadels proper for a State; cities have their ſeveral complexions, as well as the individuals which compoſe them, and nations the ſame; ſome men are cholerick, others bold and daring, ſome timorous, ſome

* *Diodorus*, lib. 22. cap. 4.

drunk-

drunkards, others entirely given up to women. The *Athenians* heretofore had the reputation of being too forward and bold in undertakings above their ſtrength; thoſe of *Lacedemon* backward and ſlow to undertake even where aſſured of ſucceſs; the *Aſiaticks* in general were accuſed of effeminacy. In Monarchical States it is proper to have Citadels in the towns of greateſt power and ſtrength, where the inhabitants are fickle, bold, and fond of their liberties.

When *Charles* V. viſited the city of *Naples*, the Nobles of that Kingdom accompanied him to ſhew him the magnificence of their Capital; that Monarch taking notice of the white horſes he ſaw painted up and down in ſeveral parts of the city, unharneſs'd, unbridled, and in appearance wild and unbroke, very gravely ask'd the meaning of it; they told him 'twas the Arms of their city, and an emblem of the diſpoſition of its inhabitants, who could not ſubmit to a harſh and rigorous government. 'I intend, ſays he, to have a good Fort * built 'upon yonder hill, and that inſtantly; we 'ſhall perhaps by and by ſee the effects of it; 'for it is by no means proper, that ſuch a vicious horſe ſhould be without a bridle.' The Citadel at *Antwerp* was built on the ſame account.

Towns of this kind in ariſtocratical States ought to have Citadels likewiſe.

* *Chateau* ou *Fort St. Elme.*

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In Democratical States, where the people are fickle, forward, bold, and enterprizing, a Citadel tho' it be an encroachment on their privileges, is neceſſary in their Capital to reſtrain the giddy multitude, and check the ambition of any ſingle perſon. The Citadel of *Athens* would have prevented the ſucceſs of *Pyſiſtrates*'s enterprize, if it had been guarded as it ought to have been; and had not that tyrant found means to get poſſeſſion of it by policy, he never could have effected the making himſelf maſter of the government of that famous Republick, and there eſtabliſh'd his tyranny. Where the people are thus inclined, Citadels are uſeful in all great towns, be their form of government what it will.

The people's love of their Sovereign, and attachment to his government is another article to be conſider'd. In a Monarchy, if a King happens not to be beloved by his ſubjects, he muſt make himſelf fear'd by them, by building Citadels in his largeſt cities; obſerving likewiſe the ſame meaſures in regard to thoſe who in point of intereſt are leſs dependant on him than others; as the inhabitants of his frontier towns, who have large dealings with the neighbouring States, and whoſe trade might perhaps be conſiderably encreas'd, if they were under the ſame government. 'Twas partly on theſe motives that the town of *Liſle* in *Flanders*, while belonging to the King of *Spain*, always wiſh'd to be under the *French* government; which

which interest of theirs, together with the marks of zeal since given by them on the most important occasions, have enroll'd its inhabitants amongst the most faithful of the King's subjects. A farther reason for building Citadels in such towns as may be too well inclined to a neighbouring State, is the easy manner in which they may be succonr'd by the enemy, as well as the possibility of their drawing other towns of the same Province into their cabals, who may either have the same interests with themselves, or dependances of some other kind. The number of Citadels, Castles, Forts or Redoubts, proper to be built on such an occasion, whether a single one or more, must be discretional, and can only be determin'd by other circumstances.

Mezeray tells us, that in the year 1542 *Charles* VII. the more effectually to secure the town of *Bourdeaux*, betwixt whom and *England* there was grown an attachment, both on account of their mutual interests in trade, and some inter-marriages, banish'd forty of those Seigniors and Burgesses whom he most suspected, and built the *Chateau Trompette* and that of *Ha*, to keep the rest in their obedience.

In a Democracy, when composed of several Provinces and large towns, if the people of any of thos towns refuse to contribute to the publick expence, on pretence of their great distance from the common enemy, it will be but prudent to build Fortresses in those towns, as well as justice to all the rest; it was for this reason that

that in the year 1600 the States General of the *United Provinces* took the reſolution to order the building of one at *Groninguen.* 'The other 'Provinces, ſays *Ridan* * could not brook with 'patience ſeeing thoſe of *Groninguen*, whom 'themſelves had deliver'd from the *Spaniſh* 'yoke at the expence of their blood, enjoy at 'their eaſe and free coſt that liberty which the 'reſt of the Provinces had ſpared no expence 'to purchaſe. Such a partiality was of bad 'example, and could not but in time be pro-'ductive of great diſcontent in the other cities, 'and that variance amongſt themſelves tend to 'the enfeebling of the State; for which reaſon 'the Council were of opinion, that it was 'more eligible to diſoblige a ſingle town, than 'to give way to an obſtinacy ſo unreaſonable in 'itſelf, and ſo dangerous in its conſequences.

'Thoſe of *Groninguen*, ſays the ſame author,‡ 'being come to the *Hague* made their remon-'ſtrances, that the union of the Provinces of 'the *Low Countries* was founded principally 'upon two points, Religion and Liberty; that 'nothing was more incompatible with theſe 'than the building of Citadels; a yoke and 'mark of ſervitude never known to have been 'impoſed on free cities, till they had firſt been 'deſpoil'd of their liberties by force of arms. 'That they had very lately been pleaſed to diſ-'charge ſeveral cities from the hardſhip of that

* Annals, lib. 17. ‡ Annals, lib. 16.

'yoke; for which reaſon they implor'd the 'States to grant the ſame favour to thoſe of '*Groninguen*. The States made reply to the 'Deputies, in which they ſet forth, that a Ci-'tadel was no leſs the protection of peaceable 'citizens and good people, than the terror and 'curb of the ſeditious and turbulent; the in-'nocence of the one being beſt ſecured by re-'ſtraining the others within the bounds of their 'duty; That when the point was duly conſi-'der'd, they doubted not their meaſures being 'approved, not only by the cities and provinces 'of the *Low Countries*, but by all foreign na-'tions likewiſe, as it could not be ſuppoſed they 'ſhould have it either in their intentions or 'power to make an ill uſe of a Citadel to the 'prejudice of any perſon whatſoever. Laſtly, 'that it was the only means of preſerving '*Groninguen*, by reſtraining that power they 'had formerly exercis'd to the prejudice of the 'liberty of their neighbours.

When great towns are either very diſtant from, or entirely detach'd from that part of the dominions where the Sovereign reſides, 'tis likewiſe a ſufficient reaſon for building Citadels in them. The ſubjects in ſuch a ſituation have ſeldom much affection for or dread of their Sovereign, and thoſe grandees who are diſaffected to the government may more eaſily attempt to diſturb it; nay even when the nobles have no ſuch deſign of themſelves, very often the innovations and outrages of the governours force them

them into ſuch engagements; while the Sovereign is at a loſs what remedy to apply to thoſe diſorders, of which by reaſon of his great diſtance he is ignorant of the real cauſe. The ſafeſt way therefore is by building Citadels in ſuch towns, to put it out of their power to attempt any thing to the prejudice of their Sovereign, whatever cauſe of diſcontent they may have receiv'd from their governors.

CHAP. III.

Of the place where the Fortreſſes ought to ſtand.

POliticians are as little agreed about the proper place where Fortreſſes built againſt the Foreign enemy ought to ſtand; ſome are for having them on the frontiers, others in the center of the dominions.

Thoſe who are for fortifying the frontiers ſay, that when thoſe are fortified the enemy cannot penetrate, unleſs he makes himſelf maſter of thoſe Fortreſſes, as it is a maxim in war to leave nothing behind; and that while he is engaged in attacking them, the Sovereign has a convenient opportunity for drawing his forces together, to receive ſuccours from his friends and allies, and afterwards either to march to their relief, or elſe make ſome diverſion in the enemy's country; that when the Fortreſſes are

in the center of his dominions, after the enemy has once enter'd the country, the Sovereign cannot eaſily draw his forces together; and thus the aſſailant being maſter of the field, ſoon becomes ſo of the ſtrong-holds, and conſequently of the whole State.

The Politicians reaſons who are for having the Fortreſſes in the midſt of the country, are as follows; that in a large and open State it will be difficult for a few Fortreſſes to prevent the enemy's paſſing between ſome two of them, and a vaſt expence to build ſo many as would be neceſſary to prevent his penetrating at all events, and ſtill greater to keep them in repair and garriſon them, which would even require a greater number of troops to be kept in conſtant pay than would form a good army; ſuch an expence as none but a Prince of exceeding great power could afford; and in that caſe, it would be better to maintain that army conſtantly in the field than to keep it block'd up and apart in ſeveral places; the rather, as when a powerful enemy has once enter'd the State, the Fortreſſes will not be able to prevent his drawing proviſions and forage from the open towns and villages, by ſending ſtrong eſcorts with thoſe foraging parties; for his garriſons being diſpers'd up and down, no ſingle one will be capable of oppoſing ſuch eſcorte; and if he would join ſeveral of them together, two very great hazards muſt be run in attempting it, for they may either be defeated very eaſily upon their

march,

march, or the places ſo ſtript of their garriſons attack'd and taken by the enemy. To which they add, that it is much eaſier for an enemy to make himſelf maſter of ſuch Fortreſſes as ſtand upon the frontier than of ſuch as are in the heart of the State, as he can with ſo much eaſe and convenience be ſupply'd from his own country, both with proviſion, ammunition, and whatever elſe he may ſtand in need of for ſuch an enterprize.

Theſe ſeveral reaſons on one ſide and t'other, how judicious ſoever, by no means determine the point: To decide the queſtion, we muſt conſider the greatneſs and power of the State.

If the State is very great both in extent and power, the Fortreſſes intended againſt foreign enemies ought all of them to be placed on its frontiers, removing them far from the center of the dominions, to keep the enemy likewiſe and danger at a diſtance; that while he is amuſing himſelf with attacking them, the reſt of the country may be at peace, and the Sovereign have leiſure to prepare to make head againſt them: It would be rather hurtful than ſerviceable to have thoſe Fortreſſes in the heart of the State, becauſe as on the one hand there is no foreign enemy there to be apprehended, ſo on the other hand there is a danger to be fear'd of furniſhing the ſeditious with a handle for rebellion, and who, if they ſhould once make themſelves maſters of them, the

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Prince would have a great deal of trouble to bring back to their duty.

Monſ. *de Rohan* ſays,* that 'Powerful States 'ought to have only a ſmall number of For-'treſſes, thoſe to be very good ones, and upon 'their frontiers, but none in the heart of their 'State; becauſe as they have more reaſon to 'be apprehenſive of civil wars than foreign 'ones, and a great Empire is never to be at-'tack'd without the former, 'tis at once to re-'move both the pretence and means of their 'ſubſiſtence.'

Heretofore, ſays the Chevalier *de Ville*,‖ they began their Fortifications by building Towers, and before they had finiſh'd them, perceiv'd they could be of no ſervice but for a retreat to the malecontents; of which we ſaw many inſtances in the civil wars of *France*. Whenever they are found in the heart of a great State, 'twill be but prudence in the Sovereign either to demoliſh them by his expreſs command, or to leave them to be ruin'd by time.

If a Prince is of an indifferent degree of power, and his dominions of a mean extent, it will be proper not only to fortify his frontiers, but likewiſe one town towards the center of his dominions, which ought to be that of his own reſidence. When his frontier places are fortified, there will be no neceſſity for maintaining a garriſon in his Capital in time of peace; he

* *Parfait Capit.* chap. 1.

‖ Fortificat. chap. 3. lib. 1.

ought

ought rather to turn it into a magazine for laying up ammunition and victualling ſtores of all kinds, from whence, as from their head or fountain, to ſupply all the reſt of the Fortreſſes in his State. The reaſon why ſuch a Prince ought to have a Fortreſs in the midſt of his dominions is, that if the enemy ſhould come to be maſters of the field they might at once break into the heart of the country, drive him from his Capital, and pillage it, putting all to fire and ſword; which are but the natural conſequences of the firſt degree of licence allow'd the ſoldiers on theſe occaſions, who are not afterwards to be reſtrain'd; and ſerving the whole country and all the open towns in the ſame manner, ruin the State to ſuch a degree as not to lift up its head again for a long time; and the frontier places being unable to draw any ſupport or ſuccours from the heart, will at laſt find themſelves under a neceſſity of ſurrendering.

But when a Capital is fortified, ſhould the enemy purſue the ſame meaſures, and break into the heart of the State, the peaſants after withdrawing their harveſt and forage into thar Fortreſs, as likewiſe all the beſt of their effects, might there take refuge themſelves. The aſſailant would not dare to attack a place ſo well provided, ſtrengthen'd by ſuch a number of hands, all equally intereſted in its preſervation with the Sovereign himſelf: he would be the more cautious how he took ſuch a ſtep, as he could not be aſſured of his convoys, with the

neceſſary ſubſiſtence of his army, (and whatever elſe he ſhould ſtand in need of for ſuch an enterprize) ſafe paſſing between the Fortreſſes on the frontiers: Therefore, if he is wiſe, he will not think of attempting the ſiege till he has firſt ſecured a paſſage for his convoys, by taking thoſe places on the frontiers capable of obſtructing them; this would give the Sovereign attack'd time for raiſing new levies, for aſſembling his troops, and expecting ſuccours from his allies.

In the laſt war in *Italy* if *Turin* the Capital of *Piedmont* had not been fortified, the *French* General by purſuing ſuch meaſures as we have juſt now mention'd would have obliged all other fortified places in that country to ſurrender, and had conquer'd the whole State, before its Sovereign could have received from his allies ſufficient ſuccours to oppoſe him.

In the year 1672, when King *Louis* XIV. attack'd the States of the *United Provinces*, and penetrated into their country, had not the city of *Amſterdam*, which is as it were the Capital of that State, been ſhut up ſo cloſe that the King could not make himſelf maſter of it, 'tis certain in the general conſternation of that time, the reſt of the towns would all have ſubmitted.

For which reaſon the States aware of the conſequences have ſince encompaſſed that City with new works after the modern way of Fortification.

If

If *Rome*, the Capital of the eccleſiaſtick State, and of Chriſtendom, had been well fortified in the year 1527, the Conſtable of *Bourbon* had never dared to have attack'd it, at leaſt never carried it by aſſault before ſuccours could be got together; nor had that city experienc'd the unhappy conſequences of the ſucceſs of ſuch attacks. ‡ All the Barbarities that can poſſibly be imagin'd, all kinds of impious ſacrileges, horrid and cruel actions, incendiaries only excepted, were perpetrated at the ſack of that famous city, which continued for two whole months. On the other hand, in the year following, 1528, *Naples* being well enclos'd and fenc'd with fortifications, found herſelf not only in a capacity of protecting herſelf from ſuch a misfortune, but likewiſe preſerv'd the whole Kingdom. M. *de Lautrec* having amuſed himſelf too long in attacking ſome of the frontier towns on the Eccleſiaſtick State, in order to ſecure his retreat, gave the Vice-roy *Moncade* opportunity to provide himſelf before-hand with neceſſaries of all kinds for his defence; inſomuch that M. *de Lautrec* deſpairing to carry the place by force, attempted it by famine; but for want of cutting off all ſupplies of proviſions at firſt, the ſiege was drawn out to a length beyond his expectation. He came to want proviſions himſelf, ſickneſs and peſtilence crept into his camp, with which being attack'd himſelf,

‡ *Mezeray.*

he

he died. A few days after his death the army was forc'd to raiſe the ſiege; and thus that Capital, by being itſelf fortified, prevented the conqueſt of the whole Kingdom.

It may be objected to what I am here propoſing, that in a State of this kind, tho' the Capital be fortified, it is not certain the enemy will firſt fall to attacking the frontier places; that we are not to lay too great ſtreſs on that old maxim, a conqueror muſt leave no place behind him; which rule is not always obſerv'd; thoſe who have truſted to it have ſometimes found themſelves deceiv'd; that the wiſeſt and warieſt Commanders have diſpens'd with it on occaſion, as *Francis* I. did in 1524, when he went to conquer the Dutchy of *Milan*, who left *Novara*, *Pavia*, and *Savona* behind him, and march'd directly to *Milan*.

The Marquis *Spinola* did the very ſame thing the firſt time he was for conquering *Frieſeland* in the year 1610. He left behind him and on either ſide not only *Arimberg*, *Graves*, *Nimeguen*, places of very great conſequence upon the frontiers and avenues, but croſs'd the *Rhine* and paſs'd by the Fortreſſes of *Grol* and *Bliſuort*, and marching forward beſieged and took *Oldinzel* and *Lingen*.

This objection, if made, doth by no means defeat our propoſition any more than the two inſtances now mention'd. In war rules muſt vary as circumſtances vary; in the enterprize of *Francis* I. and that of the Marquis *de Spinola*,

nola, circumſtances were quite the reverſe of what we are now ſuppoſing; the places they went to attack were leſs ſtrong than thoſe they left behind or on one ſide of them, and the latter could not obſtruct the paſſing of their convoys, becauſe they had taken care to provide for themſelves otherways; they both of them did extremely well not to weaken their armies by attacking places of no conſequence in the main, and in marching directly to thoſe which were of the laſt importance; to give their enemies no time to ſtrengthen themſelves, or to provide the neceſſaries for a good defence.

Such a State, even tho' it have a good army in the field, will not be ſecure unleſs its Capital is well fortified: For armies are liable to many unlucky accidents; 'tis not ſaying, I will not run the hazard of a battle, it is not always in our power to avoid it, as may appear from what happen'd to the *Venetians* in the year 1509, when their army was neceſſitated to give battle to the *French*, without expecting orders from the Senate, at the *Guiera d'Adda*, near the village of *Aignadel*, where they left all their infantry behind them, and their General *Alvian* after having loſt an eye was made Priſoner; that had not *Venice* herſelf, the head and heart of that Seignory, been ſo advantageouſly ſituated, ſhe had at that time ſtood a fair chance for loſing her ancient liberty. For the Emperor *Maximilian* I. ſays the Hiſtorian,* had form'd

* *Mezeray.*

a ſcheme for beſieging *Venice*, to cruſh the head of that Republick at once; from all which we muſt conclude, that a Prince of a middling degree of power, and whoſe dominions are of a mean extent, ought not only to have Fortreſſes upon his frontiers, but his Capital ought likewiſe to be at leaſt as well fortified as thoſe places intended to bar the avenues of his State.

As to a weak Prince, if his Principality is of any extent, it will be moſt convenient for him to have his Fortreſſes in the midſt of his State, to ſerve as places of refuge for all his ſubjects both of the country and open towns, at leaſt for laying up their chief effects there. If his Principality is very ſmall, it is of little importance whether that ſingle Fortreſs which he builds for his own ſecurity, be placed on his frontiers, or in the midſt of his State; he is only to conſult the convenience of its ſituation in this reſpect, that if it is not the place of his reſidence, he may upon occaſion have it in his power to withdraw thither whatever he has of moſt value and conſideration; while himſelf goes in ſearch of his allies, to quicken thoſe ſuccours of which he ſtands in need.

Fortreſſes built with a view to domeſtick enemies, ought in general to be placed in thoſe parts of the State where a Prince has moſt reaſon to ſuſpect the fidelity of the inhabitants.

If the places moſt ſuſpected happen to be large towns, care muſt be taken to build the Citadels on ſuch a ſpot of ground as that,

Firſt,

Firſt, They may command the town, and not the town the citadel.

Secondly, To build them in ſuch parts of the town as are ſtrongeſt by their ſituation; for inſtance, either cover'd by a moraſs or inundation, or on the ſummit of a ſteep mountain, inacceſſible on the ſide next the country, *&c.* in in order to put the beſiegers under a neceſſity of beginning with the attack of the town.

Thirdly, That they be ſo placed as to prevent any ſuccours from being ſent into the town, in caſe the inhabitants ſhould revolt; to which purpoſe they muſt command the moſt important and principal entrance. As in maritime towns the Citadels ought to be placed on that ſpot where they may with the greateſt advantage command the entrance of the harbour, as thoſe of *Havre de Grace*, *Breſt*, *Blavet*, and *St. Maloes* are; as to towns ſituate on a river they muſt be placed either up or down the ſtream, as may be moſt convenient for intercepting any ſuccours ſent from their powerful neighbours to aſſiſt the revolted inhabitants.

Strada ſays,* this maxim has been violated in the ſituation of the Citadel of *Antwerp*, becauſe as it is placed on that ſide of the *Scheld* which looks towards *Brabant*, it cannot obſtruct an enemy coming on the *Holland* ſide, who would enter *Antwerp* that way; and which it might have done, had it been built on the

* *Strada*, lib. 7.

other

other ſide of the town, towards the mouth of the *Scheld*, looking towards *Holland*. Others however defend the ſituation, by ſaying the Duke of *Alba* in building that Citadel rather conſider'd how he might defend himſelf againſt the town, than the town againſt a foreign enemy. They add, that there was a good reaſon for building it on that ſide, where *Spain* could eaſily draw ſuccours from all the Provinces round about, which ought to be a conſideration of the firſt rate with thoſe who build Citadels; and if that of *Antwerp* had been turn'd towards *Holland*, it muſt have wanted that convenience. For my own part, I am perſuaded, *Serbillon* who conducted that work, had no ſuch thought at that time, becauſe when that Citadel was built *Holland* was as much under the King's ſubjection as *Brabant*; and therefore the paſſage was left open on both ſides for receiving of ſuccours; but I am of opinion, that in placing it where it now ſtands regard was had only to the ſecurity of the place, for as it is a flat country all about it, and that part leading towards *Holland* lies ſo low, that the river is forc'd to be ſuſtained by dykes, to prevent its overflowing and ruining the villages; 'twould have been imprudently done to build it on a ſpot where the enemy had no more to do but to cut thro' the dyke to make themſelves maſters of it; whereas ſtanding as it now does upon ground higher than the water, 'tis not liable to any poſſibility of ſuch an inconvenience: And altho'

Flan-

Flanders has ſince been divided, and *Holland* fallen into the hands of an enemy, we ſhould not even now fail of that advantage in the Citadel, which was one of its firſt objects, the eaſy receiving ſuccours from all the Provinces under the obedience of *Spain.*

Fourthly, Citadels muſt be built in ſuch places as it may not be in the power of the town to prevent their receiving ſuccours from without: 'tis on this account they are not to be plac'd in the midſt of the town, where the inhabitants might beſiege them on all ſides, and keep out ſupplies of what they ſtood moſt in need; for the ſame reaſon, when a river runs either by or through a town, and there is no danger of any foreign ſuccours being ſent the inhabitants, the Citadels ought always to be placed up the ſtream, that the Prince may with greater eaſe receive ſuccours into the Citadels.

If the parts of the country ſuſpected by the Sovereign are ſuch diſtricts where there is either no town or very ſmall ones, his Fortreſſes ſhould be placed on ſome riſing grounds, from whence he may command the flat country with the greateſt advantage, diſpoſing them after ſuch a manner as to ſtrike terror into all quarters of that diſtrict, as *Tacitus* reports of thoſe built in *England* by *Agricola.*

CHAP. IV.

Of the conditions which render Fortreſſes important.

AMongſt the many conditions which conſtitute the importance of a Fortreſs, ſome are of ſo much greater weight than others, as ought to determine the Prince without any heſitation to fortify the place where theſe are found, rather than where all the reſt concur; for which reaſon we ſhall ſpeak of them according to the rank they bear with reſpect to themſelves.

A Fortreſs is of importance to a State,

Firſt, When it ſerves as a key or inlet to that State; that is to ſay, when by well fortifying the ſpot where it ſtands one may with the aſſiſtance either of a few or more there defend oneſelf, make head againſt a powerful army, and prevent them penetrating into the country, till they have firſt made themſelves maſters of it, unleſs they chuſe to run the hazard of periſhing for want of proviſions and neceſſaries for their army. If when there is a particular avenue through which an enemy muſt neceſſarily paſs to enter the Kingdom, the Sovereign ſhould build a Fortreſs at a diſtance from that ſpot; tho' it's natural ſituation be ever ſo ſtrong, that Fortreſs cannot be call'd important, becauſe an army may enter the State without any neceſſity

ceſſity of attacking it, or making themſelves maſters of it; ſuch is that of *Malmoe* in *Scania*, a maritime Province of *Sweden*, which has been fortified rather on account of its eminence than for any importance of the poſt.

Fortreſſes which bar the entrance of a State are,

Firſt, Such as ſtand either at the inlet or outgoing, or in the midway of a narrow neck betwixt two mountains, through which an enemy muſt neceſſarily paſs to enter it; and which conſequently cover all the country behind them: Such was the ſituation of *Sutrium*, a confederate town of the *Romans*, which was call'd the ‡ gate or key of the *Tuſcan*; the ſame may be ſaid of *Briancon*, and ſome other places of the *Alps* and *Pyrennees* with regard to *France*, and of *Fonterabia* in reſpect to *Spain*: When places of this kind are not fortified, the country lies open and expoſed to every invader.

Amongſt theſe mountain-paſſes 'tis rare to meet with any where the paſſage is abſolutely barr'd on both ſides of them; there are few where an army would not find a way to penetrate either to the right or left; 'tis their ordinary defect.

Secondly, Such as ſtand upon great rivers at places thro' which an enemy may or ſhould paſs to enter the country. Theſe were the reaſons

‡ *Tit. Liv.* lib. 9. Decad. 1.

which induced the *Romans* in the time of *Hannibal** to build *Cremona* upon the *Po*; and for the ſame reaſons the town of *Auxona* upon the *Saon*, and *Perron* and other places upon the *Somme* were fortified, when the Seventeen Provinces of the *Low Countries* belong'd all to one Sovereign.

'Twas likewiſe for the ſame reaſon that *Louis* XIV. order'd the fortifications of ſome places of his Kingdom, which ſtand upon the borders of the *Rhine* on the *French* ſide, to be enlarg'd, and ſome new ones to be built, as *Fort Louis*, *Huninguen*, and *New Briſac*; and it was principally upon this account that the Empire was with ſo much difficulty prevail'd on in the two laſt treaties of Peace, to conſent that *Strasburg* ſhould remain in the hands of the King of *France*; becauſe that city commands one of the principal Paſſes of the *Rhine*, and that without Fort *Kehl* it would leave an open entrance into *Germany*, and ſhut up that of *Alſace*: It may likewiſe very well be ſaid to be a place of importance, both on account of its greatneſs, and the riches and number of its inhabitants.

Thirdly, Fortreſſes which bar the entrance of a State are ſuch as ſtand on the ſea ſhore, where a deſcent and debarkment may conveniently be made; ſuch are all places on the maritime coaſts, where it is eaſy ſtepping a ſhore, and where

* *Tacitus* Hiſtor. lib. 3.

nature

nature has made good anchorage roads and harbours; for this reaſon *Gayetta* is call'd one of the gates of the Kingdom of *Naples*, with reſpect to thoſe enemies who can attack it only by ſea: A great many of the maritime towns of the Kingdom of *France* may properly be called by the ſame name, more eſpecially *Calais*, on account of its nearneſs to *England*, and which for this reaſon was formerly call'd the *Engliſh* ladder of deſcent.

One ſingle Fortreſs of this kind well built may be the means of ſaving a whole country; too much care therefore cannot be taken either in their conſtruction, or of their guard and maintenance.

Secondly, A Fortreſs is of importance when ſerving for a communication between ſeveral parts of the State; thus *Luxembourg*, *Cologne*, &c. are of importance to the Emperor's Dominions, becauſe they are the towns through which his troops muſt paſs on their march from *Germany* into the hereditary *Low Countries*; as are *Trent* and ſome places of the *Tyroleſe*, ſerving for the ſame purpoſe between *Germany* and the *Milaneſe*, &c. to which likewiſe we may add *Trieſte*, ſituate on the borders of the *Adriatick*, as it lies convenient for embarking troops and warlike ſtores for the Kingdoms of *Naples* and *Sicily*.

Thirdly, A Fortreſs is of importance when being fortified itſelf, and lying amongſt ſeveral frontier towns it may ſerve as a principal ma-

gazine either for ſupplying that army which covers the frontiers, or the neighbouring towns upon occaſion; of this kind is *Arras* in *Artois*, and *Perpignan* in *Rouſſillon*, &c. It is abſolutely neceſſary that places of this kind ſhould be fortified, leaſt the enemy ſhould get poſſeſſion of them, and fortify them, by which means all the reſt might be extremely incommoded.

Fourthly, A Fortreſs is of importance, when capable of ſerving as an aſylum or place of refuge for the people of a certain diſtrict of the country, and their effects, and may prevent the enemy's making any ſettlement there; in which reſpect ſeveral of thoſe Forts built in the *Eaſt* and *Weſt Indies* by the Princes of *Europe*, may be ſaid to be important.

Fifthly, A Fortreſs is of importance when it may be a means of preventing the inhabitants of any great city, or a whole country, from caſting off their obedience and ſubjection to their Sovereign; ſuch was the Citadel of *Corinth* heretofore, which for ſome time kept the *Peloponeſus* in obedience and ſubjection to *Philip* of *Macedon*, the father of *Perſeus*, and ſuch are the Caſtles and Citadels of many great towns at preſent, and ſome Forts built in certain Diſtricts.

Sixthly, A Fortreſs is of importance when ſtanding in ſome ſtreights mouth or paſs it may

1. Impoſe and exact cuſtoms on ſhipping and merchandize, which muſt neceſſarily paſs that way on their voyage from one country to another, or on refuſal deſtroy the trade of thoſe foreign-

foreigners, and enlarge that of their own ſubjects; of this kind is the Fortreſs of *Elſinore* belonging to the King of *Denmark*, ſtanding in the Straits of the *Sound*, at the entrance of the *Baltick*, and which obliges all ſhips to pay toll that paſs that way.

2. When ſtanding in the neighbourhood of a fruitful country it may either admit of the importing whatſoever is neceſſary for human life in their own country bottoms, or ſtop all foreign ones freighted with thoſe commodities, and oblige them either to ſell, or traffick them for thoſe things with which themſelves moſt abound; of this kind are the two famous Caſtles of the *Dardanelles*, ſtanding near the ancient towns of *Sectos* and *Abydos*, in the chops of that channel which joins the *Ægean* to the *Propontick*, and forms the mouth of the harbour of *Conſtantinople*, formerly *Byzantium*. What *Polybius* ſays of the advantageous ſituation of that famous city deſerves here to be related, 'The *Byzantines*, ſays he, are ſeated in the moſt 'commodious place imaginable for tranſporting 'thither by ſea whatever may contribute ei'ther to the convenience or luxury of man'kind; their ſituation on the land ſide indeed 'is not ſo favourable; as to the ſea, their city 'ſtanding on the brink of it, no ſhip can either 'enter the port, or depart without their leave; 'and if the *Pontick* brings an infinity of things 'neceſſary for the uſe of men, the *Byzantines* 'are maſters of them. The countries border-

'ing upon the *Pontick* furniſh us with hides,
'and good ſlaves in plenty for the common uſes
'of life: and for luxury, plenty of honey, bees-
'wax, and ſalt-meats, and many other things
'of the kind; themſelves are likewiſe furniſh'd
'by ſea with whatever our country produces,
'as oils and wines of all ſorts; ſometimes they
'deal in corn, which they either import or ex-
'port, and ſtill find their account in it. The
'*Greeks* would not be able to traffick at all in
'thoſe commodities, or muſt trade to little
'advantage, if either the *Turks* ſhould make
'an alliance with the *Galatians* and *Thracians*;
'or did not inhabit that country themſelves;
'for we ſhould no longer be at liberty to na-
'vigate the *Pont*, by reaſon of the narrows and
'that multitude of Barbarians which inhabit
'thoſe parts. I am fully convinced 'tis owing
'to the advantages of their ſituation, that the
'*Turks* are enabled to make ſuch vaſt profits,
'either by exporting thoſe commodities which
'they have in ſuch abundance, or importing
'thoſe they want; at the ſame time it muſt be
'acknowledg'd, thoſe who deal with them find
'their account likewiſe: And 'tis for this rea-
'ſon, as they are uſeful to the whole world,
'that the *Greeks* have them in ſuch high eſ-
'teem, and think them not only deſerving of
'the acknowledgments they pay them, but
'the aſſiſtance of all *Greece* upon occaſion.

'Tis ſaid the Czar of *Muſcovy* has in his view the

* *Greece.*

the making himſelf maſter of the *Palus Mæotis*, to extend his Dominions from *Aſoph* to the Straits of *Capha*; from whence he propoſes to himſelf one day or other this advantage, that by building a good Fortreſs in the Straits of *Capha*, he ſhall be able to oblige the *Turk* to pay him tribute, in the ſame manner it is practiſed in the *Sound*, and to grant a permit for his veſſels to trade in the *Mediterranean*, by this means to vend his own ſea ſtores, and other manufactures of his country, to extend his commerce and enrich his people.

Fortreſſes built in Straits not altogether ſo narrow as the former, are likewiſe of importance, becauſe in time of war the enemy cannot paſs ſafely without an eſcort ſufficient to protect them againſt ſuch ſhips as may ſally out of port there, nor in bad weather take the benefit of their roads and harbours; ſuch are the Faro of *Meſſina*, the Straits of *Gibralter*, and the Paſs of *Calais*.

Seventhly, A Fortreſs is of importance when ſtanding upon the ſea it has a good road and good harbour, or at leaſt is in a capacity of having them made; and from whence a fleet well equipp'd and ſent out proportionable to the maritime force of the enemy, may make themſelves maſters of the ſea, give chace to the enemy's ſhips, and a ſafe and convenient retreat to their own in caſe of a purſuit; ſuch are *Toulon* and *Breſt*, and ſuch was *Dunkirk* before it was demoliſh'd.

As the importance of theſe laſt places depends upon their road and harbour, it will be neceſſary to explain the nature of both, and their moſt eſſential properties.

A road in general is a tract of ſea at ſome ſmall diſtance from the ſhore, where ſhips may ride at anchor, ſhelter'd from the winds in certain points; of theſe there are two kinds, natural ones, and thoſe of a mixt kind.

The firſt are the ſimple work of nature, which ſhe ſeems to have given mankind as a model for their imitation, when they would form ſuch a one as ſhould be moſt for their own convenience; ſuch is that road deſcribed by *Virgil* in the following verſes;

——————— *eſt ſpecus ingens*
Exeſi latere in montis, quo plurima vento
Cogitur inque ſinus ſcindit ſeſe unda reductos:
Deprenſis olim ſtatio tutiſſima nautis.

Such are the roads of *Toulon* and *Breſt*, the laſt of which is ſo large, that foreign pilots frequently call it the bay of *Breſt*.

The ſecond kind are thoſe to which men have made large additional works of maſonry, of earth, ſtone, or timber work, to render the acceſs and abode of ſhips more convenient and ſecure; theſe works are called dykes, piers, moles, which the ancients uſually called *Ageres*, being a common name for any mound of earth or heap of ſtone much higher than the uſual ſurface of the earth; ſuch were thoſe moles which the Emperors *Antoninus* and *Mar-*

cus

cus Aurelius repair'd upon the *Tyrhene* ſea, near the town of *Ardres* in the *Latin* territory, about twenty miles diſtant from *Rome.*

For a road to be good the bottom muſt be of good holding ground, the road itſelf ſecurely ſhelter'd from ſtorms, and of ſo commodious a depth that ſhips of the firſt rate may come with ſafety and caſt anchor within a cable's length of the ſhore; or if they could even run their heads aſhore it would be ſo much the better.

A port or harbour is that part of the ſea-coaſt, which lying within the land, ſerves as a retreat for veſſels from ſtorms and tempeſts, and for loading and unloading upon occaſion, as likewiſe for a protection againſt attacks of all kinds from the ſhips of the enemy.

Of theſe there are three kinds, natural, artificial, and thoſe of a mixt kind.

Of the firſt are thoſe which nature has herſelf made perfect, like that of *Athens* formerly. * *Thucydides* obſerves that port contain'd within itſelf three other, and each ſo perfect without owing any thing to human induſtry, that foreigners on their arrival were at a loſs which to prefer as the moſt convenient and ſafe abode. That celebrated harbour is by long tract of time ſo choak'd with ſand, that at preſent it can only receive ſmall veſſels. The port of *Carthagena* in *Spain* is likewiſe the hand-work of nature only; it is the ſafeſt harbour in all *Spain,*

* Lib. 1.

Spain, and capable of containing any fleet how large ſoever. A *Spaniſh* author fancies it was that natural haven of which *Virgil* has given us ſo beautiful a picture in the firſt book of his *Æneid:*

Eſt in ſecceſſu longo locus, inſula portum
Efficit objectu laterum, quibus omnis ab alto
Frangitur, inque ſinus ſcindit ſepe unda reductos;
Hinc adque hinc vaſtæ rupes, geminique minantur
In cœlum ſcopuli, quorum ſub vertice laté
Æquora tuta ſilent: tum ſylvis ſcena coruſcis
Deſuper, horrentique atrum nemus imminet umbrâ.
Fronte ſub adverſa ſcopulis pendentibus antrum:
Intus aquæ dulces, vivoque ſedilia ſaxo;
Nympharum domus: hic feſſas non vincula naves
Ulla tenent, unco non alligat anchora morſu.

Within a long receſs there lies a Bay,
An Iſland ſhades it from the rolling ſea,
And forms a port ſecure for ſhips to ride;
Broke by the jutting land on either ſide,
In double ſtreams the briny waters glide,
Betwixt two rows of rocks; a ſylvan ſcene
Appears above, and groves for ever green.
A grot is form'd beneath, with moſſy ſeats
To reſt the *Nereids*, and exclude the heats.
Down thro' the crannies of the living walls,
The cryſtal ſtreams deſcend in murmuring falls.
No hawſers need to bind the veſſels here,
Nor bearded anchors, for no ſtorms they fear.

Mr. *Dryden's* tranſlation.

In the liſt of theſe natural harbours we may place *Breſt*, which is one of the beſt and moſt ſpacious in the Kingdom; *Toulon* likewiſe, but above all *Malta*, which including two other

good

good ones, is capable of receiving the largeſt fleet that any Prince can ſend to ſea. Such likewiſe are the ports of *Carelſcroon* and *Gottenburg* in *Sweden*, and almoſt all thoſe of the Kingdom of *Norway*. As tempeſts are very frequent in that ſea, nature ſeems to have provided for them accordingly by the great number of good harbours ſhe has made there without borrowing any aſſiſtance from art.

Artificial ports are the work of men's hands, to which the *Greeks* and *Romans* gave the name of *Catones*, or rather *Cutones*, according to *Feſtus*, who ſays, '*Cotones ſeu Cotones appel-*
'*lantur Portus in mari tutiores, arte & manu*
'*facti*;' ſuch was the port of the famous *Carthage* in *Africk*, defended by the Fort call'd *Birſa*, which *Scipio* beſieged before he could attack that city: Thus ſays *Appian*, '*ineunte*
'*deinde vere Scipio Byrſan ſimul & portum quem*
'*Cotonem vocant agreſſus eſt*,' and ſuch likewiſe was the port of *Puzzol* formerly, a town near *Naples*, and made by the hands of its inhabitants, of which we ſtill ſee an arcade remaining, part of the mole to this day, and which the people call the bridge of *Caligula*. Works of this kind were extremely eaſy to them on account of the manageable property of their ſoil, ſuch as is found at this day in the neighbourhood of that city; of this *Strabo* takes notice, '*Quas ad res commodum conducit arenarum in-*
'*genium, quæ calcis quem ſimillimæ comparatæ,*
'*validiſſimum conglutinantur in modum; unde*

com-

commixta ſabulo glarea, aggeres projectant in pelagus, ripaſque patentes ſinuoſos in receſſus redigunt. The ancients rank'd in the liſt of artificial harbours that which the Emperor *Claudius* built near the mouth of the *Tiber*, on the ſhore oppoſite to *Oſtium*. To conſtruct them according to the deſign of engineers a large aperture or cavity muſt be cut in the ſolid beach, where the ground is firm, which is to be lined on all ſides with a thick and ſtrong revetment; this is to be the baſon for receiving the ſea-wtaer, from hence two great moles or pier-heads, one on each ſide, are carried out a great way into the ſea, embracing with extended arms ſuch a ſpace of water as may be capable of receiving ſhips of all kinds at its mouth or entrance, and there keep them out of the reach of all danger. *Laſtly*, At the entrance of this harbour a mole is to be rais'd in the open ſea, as big as a ſmall Iſland, for whoſe foundation a ſhip muſt be ſunk, like that famous one built for tranſporting the largeſt of the Obeliſks to *Rome* from *Egypt*. When this mole is finiſh'd, an exceeding high tower is to be built on it, on whoſe ſummit are kept watch-fires in the night for a guidance to pilots. * *Julius Ceſar* had an inclination to undertake the building ſuch a one in his time, but was diverted from his purpoſe by the greatneſs of the labour and expence. The port of *Havre* may likewiſe have a place amongſt the artificial ones, which was made

* *Suetonius* life of *Claudius*.

and

and its town fortified by *Francis* I. as that of *Dunkirk*, and many other towns in the *Low Countries*; amongſt this number may be reckon'd the canal of *Mardyke*, tho' intended only for carrying off the land-waters from the country.

Harbours of the mixt kind are ſuch as nature herſelf has not quite perfected, but left to be finiſh'd by the labour and induſtry of men: Many of the ports of *Italy* were anciently of this kind, and from their imperfect ſtate have been made beautiful, commodious, ſafe, and eaſy of acceſs; as thoſe of *Brundiſi*, *Tarentum*, *Luni*, *Meſſina*, and *Ravenna*.

Amongſt the ports above-mention'd that of *Brundiſi* was the moſt conſiderable, both on account of its extent and excellency; *in primis Brunduſis portus ſua excellentia præſtat*, ſays *Strabo*; it was one large harbour, which contain'd within itſelf ſeveral leſſer ones, all ſhelter'd and ſecur'd from the violence of the winds; having only one common entrance, from whence it extended itſelf on each ſide of the ſhore like a ſtag's branches iſſuing from the trunk; ſo that the city and port together exactly reſembled the head and horns: From whence it had the name of *Brundiſium*, ſignifying a ſtag's head in the language of that country.*

The port of *Tarentum* was large and ſpacious, but its entrance being very wide, was

* Geogr. lib. 6.

by

by that means more expoſed to the ſwell of the ſea; and in that entrance lay ſunken rocks extremely dangerous.

The port of *Luni* was ſo call'd from *Luni*, the fartheſt town of *Tuſcany* upon the *Tyrhene* ſea on the ſide next the *Alps*; that port according to *Strabo* * was very large and exceeding beautiful, and comprehended ſeveral others all of a good depth; ſo that for a long time it ſerv'd as a retreat for all the ſhipping of thoſe parts: It was likewiſe inviron'd on both ſides with very high mountains, from whoſe tops there was a very extenſive proſpect of the ſea.

The port of *Meſſina* took its name from the mountain at whoſe feet it lies, it was very ſpacious, and capable of containing the largeſt fleet, having near it three bays, to wit, that of *Bayes* or *Baia*, that of the *Mare mortuum*, and *Avernum*, where ſhips according to *Florus* were likewiſe in ſafety.

That of *Ravenna* was the work of *Auguſtus*, where he built a camp in the form of a ſmall city, for quartering his marines in the winter ſeaſon. The ancient Geographers deſcribe that city as reſembling *Venice* in its ſituation, being built on piles in the midſt of the waves. It was heretofore the principal ſea-port the *Romans* had in the *Adriatick* gulph; but the appearance of that place is now quite alter'd; not only the *Lagunes* are become dry, but the ſea fallen

* *Geog.* lib. 5.

off

off three miles from thence; and what was formerly a drown'd country is now one of the moſt fertile ſpots in *Italy*. It was in theſe two ports of *Ravenna* and *Meſſina* that *Auguſtus* was for keeping two fleets for the defence of the Empire; * *Claſſem Meſſini & alteram Ravennæ ad tutelam ſuperi & inferi maris.*

Of theſe three ſeveral kinds of harbours the latter are the moſt ordinary, there being few which nature has made ſo perfect as to have left no defect in them. That of *Genoa*, for example, is ſpacious and deep enough, but expoſed to the moſt tempeſtuous winds that reign in that part of the *Mediterranean*, lying almoſt open to the ſouth-eaſt: 'Tis long ſince they were obliged to raiſe a mole there, extending about 500 paces from the city; and finding that not ſufficient, have ſince carried out another of equal length on the oppoſite ſide, from the point of *Faro*.

The properties of a good harbour are, a ſufficient depth of water for large ſhips to enter at any time, whether the ſea be in or out. Good offing, and eaſy acceſs out of all danger from the winds; free entrance, without rock or ſand-bank; the entrance ſo ſtrait as to be eaſily barr'd and defended upon occaſion, and to preſerve the waters in its baſon from being ruffled by the billows of the ſea; not to be ſubject to overflow; that ſhips may lie ſo cloſe within

* *Suetonius in Octav.* cap. 49.

ſhore

ſhore as for their heads to touch the key; and ſhelter'd from all winds by the high mountains which ſurround it, and from whence you have a long ſurvey of the ſea. Laſtly, that the ſhipping there be out of the reach of all danger, either of being ſet on fire, bombarded, or cannonaded from ſea by the ſhips of the enemy.

'Tis rare to meet with harbours where all theſe properties are to be found, 'tis ſufficient if they have the moſt eſſential of them. Good harbours make a part of the ſtrength of a State, and are one of the principal means of its aggrandiſement. *Strabo* aſſigns them the ſecond place amongſt the cauſes of the Greatneſs of the *Roman* Empire; '*cum multa a nobis diſputata ſint, nunc ampliſſima ſignificabimus, quibus hoc tempore ad tantum majeſtatis faſtigium res Romana conſcenderit.* And afterwards he ſays, '*Secundum eſt maxima ex parte ipſius importuoſitas, & quod ſic ubi portus exiſtunt, magnitudine & excellentia mirabiles adſtant adverſus externorum impetus commodi, nec minus ad inferendas excurſiones quam ad ipſam mercaturæ commoditatem & abundantiam.* Lib. 6. Geog.

Having already ſaid as much or more concerning roads and harbours than our ſubject required, let us now return to Fortreſſes.

Eighthly, A Fortreſs is of importance to a State when ſerviceable to commerce, as it may by that means contribute both to the enriching the people, and encreaſing the revenues of its Sovereign. It is advantageouſly ſituated for com-

commerce, when ſtanding either upon the ſea ſhore, with a good port, as *Rochelle*, *Marſeilles*, &c. or upon ſome large navigable river, like *Bourdeaux* on the *Garonne*, *Nantes* upon the *Loire*, and *Roan* upon the *Seine*; or on the banks of canals or ſmall rivers, having a communication with a great many conſiderable towns, as *Liſle* in *Flanders*; and where the inhabitants have a particular talent at making things of common uſe and convenience, as at *Abbeville* and *Sedan*, famous for ſome kinds of woollen manufacture; or laſtly, where the neighbouring country affords any of the neceſſaries of human life.

Ninthly, A Fortreſs is of importance, when ſtanding upon a frontier it is very large, and popular, its inhabitants very rich and capable of contributing more than is required of them towards the charge of the fortification, and maintenance of the garriſon, as *Strasbourg*, *Liſle*, *Beſançon*, &c.

Tenthly, A Fortreſs may be of importance, when being very ſtrong by nature, and the Prince having domeſtick enemies to guard againſt, it may ſerve as a depoſitory for his valuables and treaſure, to prevent their falling into the hands of the enemy, and being made uſe of againſt himſelf in war. When a Prince has a large hoard of treaſure it is of the utmoſt conſequence to him to have it lodg'd in ſome place of ſafety, and committed to the care of truſty and vigilant perſons. In the

hiſtory of *France* we have an example to this purpoſe well worth remarking, in the perſon of *Charles the Simple* and *Aganon* his favourite and firſt miniſter, * *Robert* Count of *Paris* having ſurpriz'd the city of *Laon* and ſeiz'd the treaſures which *Aganon* had laid up there, with that money gain'd over to his intereſt a large party of the *French* nobility, and procured himſelf to be elected and crown'd King at *Rheims*, by Archbiſhop *Hervé*, the twentieth of *June* in the year 722.

A Prince ſhould never order a Fortreſs to be built unleſs it may be of importance to his State in ſome or other of the circumſtances abovementiond; the expence of its conſtruction and maintenance is too conſiderable to engage in, without a certainty of reaping ſome benefit from it in time of war.

The beſt Fortreſſes of any kind are ſuch as ſhut up the entrance of their State, and furniſh the means of attacking the enemy in his own country at the ſame time; but if it is a prudent part in a Sovereign to ſpare no expence in building ſuch Fortreſſes as are abſolutely neceſſary to protect his country from all inſults or attacks of his neighbours, it is no leſs a point of wiſdom, moderation and juſtice, not to build under the ſpecious pretence of his own ſecurity, ſuch as may give a reaſonable occaſion of jealouſy to them; ſuch jealouſy

* *Mezeray.*

may

may very reaſonably be entertain'd when the Fortreſs is attended by any of the four circumſtances following:

1. When it is capable of ſerving as a door into the neighbouring territories, and conſequently either the garriſon or an army in time of war make incurſions that way, lay them under contributions, or waſte the country, and ſecure a retreat to themſelves when they have done.

2. When it may be made uſe of for a place of arms, and ſtore-magazine, for ſupplying an army upon occaſion when order'd to march that way.

3. When it may either be a means of facilitating the ſiege of a neighbouring Fortreſs, or is abſolutely neceſſary for that enterprize.

4. When it can obſtruct the communication betwixt any of the Fortreſſes or Provinces of the neighbouring State.

Fortreſſes of theſe kinds, ſays the author of *Telemachus*, ſerve to no other end or purpoſe but to put the neighbouring States under the neceſſity either of ſubmitting to be ruin'd themſelves, or of ruining you to preſerve themſelves from approaching ſlavery: Such Fortreſſes, tho' pretended to be built for the ſecurity of a State, plunge it into extreme danger. The ſureſt ramparts of a State are equity, moderation, publick faith, and the firm aſſurance of your neighbours that you are incapable of harbouring ſuch a thought as that of uſurping their poſſeſſions.

Your bulwarks may fail you, and fortune deſert you, but the love and confidence of your neighbours, who have experienc'd your moderation, will render your State invincible. Such States are ſeldom if ever attack'd, or ſhould an ambitious neighbour make an attempt of that kind, all the reſt intereſting themſelves in your preſervation, would fly to arms in your defence; and the united aſſiſtance of ſo many nations who would find their own intereſt in ſupporting yours, would make you a more powerful Prince than ſuch Fortreſſes, which would ſet all the world againſt you. If a Prince makes it his firſt aim to avoid all occaſions of jealouſy in his neighbours, his country will flouriſh with the bleſſings of peace, and himſelf become the arbiter of other nations; but if he gives them reaſon to ſuſpect that he is forming deſigns upon their liberties, all will conſpire againſt him, even thoſe who take no part in the war will wiſh his abaſement, nor will jealouſy leave him a ſingle friend.

The circumſtances under which a Prince intending to build Fortreſſes of this kind, to ſhut up the avenues of his own country, and make an opening into that of his neighbours, ſhould have no regard to that jealouſy, are, when he is inferior in power to that neighbour, when the advantages he derives from thoſe Fortreſſes are manifeſtly leſs calculated for the attack of others than for his own defence; or laſtly, when they are abſolutely neceſſary for the ſecurity of his country.

CHAP.

CHAP. V.

Of the conditions which render the ſituation of Fortreſſes advantageous or diſadvantageous.

IF it is of moment to build no Fortreſſes but what may be of importance, it is no leſs ſo to have particular regard to the advantages of their ſituation; for it is with Fortreſſes in point of perfection as it is with mankind, in the latter the beſt education is thrown away where a genius is wanting; nor is it in the power of art to make a Fortreſs what it ought to be, unleſs ſeconded with a happy ſituation. Art indeed in both caſes may remedy certain defects, but there are circumſtances in which nothing is to be done, eſpecially with regard to Fortreſſes; there are particulars in the article of ſituation ſometimes ſo abſolutely neceſſary that it is not in the power of human induſtry, or the moſt unbounded expence to ſupply the want of them; for inſtance, if a Prince's power conſiſts wholly in the ſuccours of his allies, for them to have opportunity and means to ſuccour him, it is abſolutely neceſſary the ſituation of his Fortreſſes ſhould be difficult of attack by open force, difficult to be beſieged, and eaſy to be relieved; which three qualifications, but particularly the two laſt, are in the gift of nature only.

By the ſituation of a Fortreſs we underſtand the various circumſtances of the ground round about it, and of the particular ſpot on which it ſtands; we ſhall diſtinguiſh them into dry land, aquatick, and common ſituations.

By dry-land ſituations we mean ſuch as are upon *terra firma*, and above a large cannon ſhot from either ſea, lakes, rivers, moraſs, or canals. By aquatick we mean thoſe which either ſtand in the midſt of ſuch waters, or are ſurrounded on all ſides by them. And, under the term of common ſituations are comprehended ſuch as ſtand on the borders of thoſe waters only, and are not entirely detach'd from the land.

Of theſe three kinds of Fortreſs-ſituations, ſome are upon an even plain, others upon a broken one, ſome upon the ſummit of a land-mountain, others on the decline of it; ſome again are partly on the decline of the mountain and partly on the plain, ſome upon a ſmall riſing ground, others in a valley; and laſtly, ſome upon rocks ſteep and inacceſſible.

Each of theſe ſeveral kinds of ſituation may be ſubdivided again into others, according to the different circumſtances which accompany them, which are ſo numerous it would be a difficult matter to find two perfectly alike: We ſhall ſpeak of all thoſe various circumſtances in explaining the conditions and properties required in a ſituation to merit the building of a Fortreſs here.

Theſe conditions and properties are eight in number, we ſhall treat of them according to their ſeveral degrees of advantage.

SECTION I.

Of the firſt condition of a ſituation.

THE firſt neceſſary condition or property in the ſituation of a Fortreſs, is not to be unhealthy, and to have ſufficient quantity of water; otherwiſe the troops in garriſon can neither have health, ſtrength, vigour, nor ſpirit, qualities all abſolutely neceſſary to enable them to ſupport the fatigues of their duty, in the guard and defence of places; without this property, all others how advantageous ſoever, can be productive of no effect.

A ſituation may be unhealthy, from three cauſes, either from the air, the water, or the fruits of the earth.

There is no denying a mutual communication between air and bodies, and that it is extremely difficult for the one to be infected without the other partaking at the ſame time; the badneſs of the air may be diſcover'd by the colour and complexion of the inhabitants, by their habit of body, or by ſome particular circumſtances in the ſituation.

The air of an inhabited country is certainly unwholeſome when the inhabitants are of a

yellow or pale complexion: When a very great many epidemical diſtempers reign at certain times of the year, that great numbers of people die of them, and few of the inhabitants attain extreme old age; or laſtly, when the air is not well temper'd or qualified, being either too light and thin, as on the tops of extreme high mountains; or too groſs and heavy, as in very deep vallies or bottoms; too moiſt, as in exceſſive watery places, or too dry, as on ſandy plains; too hot, as on the ſides of ſome hills having a full ſouth aſpect; or as much too cold, as on others lying entirely open to the north: From whence we may infer, that in all countries whatſoever the moſt healthy ſituations are thoſe of a moderate elevation; and that in our choice of them we ſhould be careful in a hot country to avoid thoſe parts where the hot winds uſually blow, and in a cold country thoſe moſt expoſed to the north, always keeping at a great diſtance from fens, ſtanding waters, and other unwholeſome places; but more eſpecially if the morning winds commonly blow from thoſe quarters.

It is certain that contagious influences are communicated to bodies in proportion as they are more or leſs diſpoſed to receive them; and experience has convinc'd us there is no kind of air to which ſome perſons may not naturalize themſelves; therefore if the Fortreſs required is to be a large one, and of the people already ſent thither many are accuſtom'd to the climate

and

and but few die, ſuch places may be fortified when there are ſtrong reaſons for ſo doing; but if upon tryal few do well there, how urgent ſoever may be the Sovereign's occaſions for a Fortreſs, it would be a piece of inhumanity to attempt it, and no leſs an act of imprudence, becauſe no views of gain, how great ſoever, would tempt any one to go and live there: Beſides, in a ſiege the bad air would deſtroy more men than the enemy, and ſhould it laſt long enough, ſickneſs alone oblige the garriſon to ſurrender.

If only a ſmall Fortreſs is wanted, and the place to be occupied by the ſoldiers only; the ill effects of the bad air may be prevented by frequently ſhifting the garriſon, that the ſoldier's ſtay there being but ſhort, he may not have time to fall down.

When that bad air proceeds from the ditches the defect may be remedied in ſuch Fortreſſes where any current is to be introduced; for as it is occaſion'd by the putrefaction of the water, 'tis only ſhifting that in the ditches twice a week in the ſummer ſeaſon.

To know before-hand whether a Fortreſs will be healthy or not, it is neceſſary to examine with attention the virtues of the water on the ſpot, and whether they are calculated for preſerving thoſe in perfect health who drink it.

The water of a place muſt have ſome bad quality,

1. If the inhabitants are not of a good complexion, if they are weakly, ſubject to pains in their limbs, and ſcurvy. 2. If

2. If after boiling the water, a good deal of ſand or ſlime is found in the bottom of the kettle.

3. If the pot-herbs boil'd in it, are longer a dreſſing than ordinary.

4. If the water is foul, and either in its ſpring or courſe there are bullruſhes found, or filth of any other kind.

5. If it paſſes thro' a marſhy ground, and the ſpring itſelf is in a plain.

The third token by which may be diſcover'd whether a ſituation is healthy or otherwiſe, is the fruits and herbs which grow there; the fruits and herbs of a country cannot be of a good kind when the liver of the animal which feeds on them is livid and corrupt: 'Twas by this token, according to *Vitruvius*, that the Ancients examin'd whether the places where they wanted to build or encamp, produced good water and wholeſome ſuſtenance.

If good water is a neceſſary article in places where a Fortreſs is intended to be built, it is no leſs neceſſary that there be plenty of it; there being nothing of ſo general uſe, or ſo indiſpenſably wanted; men may make ſhift to live without corn, without fruits, without fleſh, or without fiſh, and ſubſiſt on any one of them, but without water neither animal bodies themſelves, or what is intended for their nouriſhment, can be produced or preſerved.

If no ſpring is to be found within the body of the place, as is frequently the caſe in high ſitua-

ſituations, and more eſpecially in rocky ones, ciſterns muſt ſupply that defect; there is no better water than rain-water, being compoſed of the lighteſt and fineſt particles extracted from all other waters, and which after having been for a long time purified by the fermentation of the air, are diſſolv'd by ſtorms and fall upon the earth: Neither doth the rain fall ſo frequently on the plains, as on the mountains, for which reaſon ciſterns are more to be depended upon in the latter than in the former ſituations; but if the ſinking of wells be practicable beſides, it will be beſt to do ſo in both, becauſe as ciſterns can only be repleniſh'd by the heavens from whence they drew their firſt ſupplies, if a ſiege ſhould come in a droughty year, water might fall ſhort in the Fortreſs: Beſides, it has happen'd ſometimes in places beſieged, that the concuſſion of the air and of the earth, occaſion'd by the violence of the cannon has crack'd the cemented walls which ſhould have retain'd the water.

Nor is it enough that the water be good and wholeſome in itſelf, and in ſufficient quantity, unleſs thoſe in the place be aſſured of their enjoyment of it, and the enemy have it not in his power either to cut it off, divert its courſe, or corrupt it; accidents thoſe waters are liable to which are convey'd into the town by aqueducts or other conduits from without the place. We have ſome examples in *Frontin* of places being obliged to ſurrender for want of water.

* *Servi-*

* *Servilius Iſauricus* took the town from whence he had his name, by diverting the courſe of a river which ſupplied the beſieged with water, and obliged them to ſurrender by that means. *Cliſthenes* of *Sicyon*, when he was beſieging a town, ſtopt the waters of an aqueduct, and after having poiſon'd them with a mixture of hellebore, return'd them into their former channel; which giving the beſieged the flux, obliged them to ſurrender. *Ceſar* beſieging a town in *Quercy* turn'd a water-courſe on one ſide, which from ſome ſprings ſupplied the place, and his archers at the ſame time hindering them from drawing up any out of the river which run at the foot of the town, they were forc'd to ſurrender. *Rabath* was taken by *David*, the beſieged wanting water. The Citadel of *Athens* being beſieged by one of *Sylla*'s Lieutenants, was obliged to ſurrender upon the ſame account; an infinite number of other places have been loſt by the ſame means. Situations defective in this particular are by no means to be fortified.

SECTION II.

Of the ſecond condition of a ſituation.

THE ſecond condition of a ſituation is that it ſhould be of an extent proportionable to the dimenſions of the Fortreſs intended to be built

* *Frontin*, lib. 3. cap. 7.

built on it. This is abſolutely neceſſary, otherwiſe it is impoſſible the Fortreſs ſhould anſwer the ends propoſed in its conſtruction.

If the ſituation be of ſo large an extent as to require a Fortreſs the expence of whoſe conſtruction and keeping up of the works, together with that of the garriſon, would exceed the Prince's revenue, ſuch a ſituation is good for nothing; or if it be ſo confined as to admit only of a caſtle capable of holding a few men, when the deſign of the Sovereign was to put ſuch a garriſon there as might incommode an enemy's army in ſuch a manner as not ſafely to be left either behind them, or on one ſide; in that caſe it ought alſo to be rejected.

Dry land, and mixt ſituations, when on an even plain have this advantage, that there you may build your Fortreſs as large or as little as you think proper, and regular at the ſame time.

Situations on plains and of the aquatick kind are ſometimes of a larger, ſometimes of a leſs extent, according to the proportion of the iſlands which form them.

But whatever may be their kind of ſituation, thoſe on the ſummit of land-mountains, eſpecially rocky ones, are generally ſtrait, and will only admit of the building ſome Fort or Caſtle on them; ſuch as can hold but a ſlender garriſon, and not capable of giving an enemy much diſturbance, if left behind him, or on either ſide.

When

When the place intended to be built is to bar the entrance of a State; in order for a ſituation to have the condition and property neceſſary for that purpoſe, there muſt firſt be a ſpace ſufficient within the body of the place for raiſing ramparts and cavaliers, if the laſt ſhall be thought neceſſary, and to leave an interval between the houſes and the works, for places of arms, and for highways leading to the ramparts, and for making new retrenchments there; for ſuch is the fury of great guns, that whoever depends upon a ſingle baſtion for his defence, will find himſelf deceiv'd; while the beſiegers are employ'd in beating down and deſtroying one work, the beſieged ſhould be erecting another behind it, and the latter be in a condition of defence the inſtant the beſiegers ſhall have made their way thorough the former. There muſt likewiſe be ſpace ſufficient in the center of the place for making wells, ciſterns, churches, hoſpitals, ſtreets, market-place, the grand parade, magazines for victualling ſtores and ammunition, an arſenal, ſmall armory, barracks for ſix or ſeven thouſand men, or even more in time of war, or upon other occaſions; and on the exterior ſide, or without the body of the place, room for thoſe works which conſtitute a good fortification, as counter-guards, detach'd baſtions, ditches, ravelins, counterſcarps, covertways, glacis, *&c.*

If the place intended to be built is likewiſe to command an entrance into the enemy's country, and

and to carry the war into it from thence, it muſt not only be large enough to contain every thing abovemention'd, but likewiſe to ſerve as a magazine for laying up ſuch ſtores of victualling and ammunition there as a powerful aſſailing army may have occaſion for, as well as for an azylum for a part of that army upon a neceſſity.

There are many other particulars to be taken notice of in regard to the extent of a places ſituation; but not to break in upon the order we propoſed to obſerve, we have in this Section only mention'd thoſe which relate to ſuch works, whether exterior or interior, as are ordinarily made; in the following Chapter we ſhall treat of them more at large, together with all the circumſtances with which they may be accompanied.

SECTION III.

Of the third condition of a ſituation.

THE third condition and property is, that the ſituation be not ſubject to any commandment, but on the contrary command itſelf all parts of the adjacent.

Situations which have this condition in perfection, and which are above all commandments, are thoſe upon mountains, whoſe fortifications

fications poſſeſs the whole ſummit, from whence they command the deſcent, and reign over the whole extent of the environs within reach of cannon ſhot from the works fartheſt advanc'd; that is to ſay, that there be neither riſing ground, nor brow of a hill, nor cavin, nor valley, nor hollow way, nor other bottom; at leaſt none but what may eaſily be fill'd up and levell'd.

The ſiege of a place thus ſituated muſt be of all others the moſt bloody on the part of the aſſailant, becauſe from thence you have a view quite round the enemy's works, and he in his approaches can raiſe none to command thoſe of the place; the beſieger's batteries can do no hurt to the fortification, at leaſt not from the ditch ſide, the place being then ſo much above them, the ſhot glance with little or no effect. He is obliged to make the parapets of his trenches very high, not to be overlook'd from the place, and thoſe of his batteries ſtill higher, for the cannon to be under cover when recoil'd; and after all, do what he can, he will ſtill be overlook'd, and by thoſe he cannot ſee again, becauſe very little rampart and parapet will ſerve to cover them. Thoſe within have the advantage likewiſe in ſallying, for being always above them, and keeping the upper ground, they need never come within the reach of the beſiegers, unleſs when ſecure of an advantage themſelves.

We

We may rank in this liſt of mountain-ſituations thoſe whoſe fortifications run down from the ſummit of the mountain to the foot of it, and ſtand likewiſe on the border of a plain: Such is *Old Briſac*, ſtanding not only on the border of the *Rhine*, but on an eminence which looks as if brought thither on purpoſe, and collected from a whole country ſmooth as glaſs. This Fortreſs was formerly call'd the ear of the Empire; its form, ſtrength and importance, and the confidence of the long reſiſtance it would make, in caſe of an attack, might very well give it that name.

Situations on an even plain have the foregoing advantages in part, but not in an equal degree with the preceding ones.

Situations defective in this particular are ſuch as ſtand either at the foot or on the decline of a mountain, whoſe ſummit almoſt always commands the inſide of them. Thoſe in a valley are ſtill more faulty, as from the ſummit they may be view'd all round. Such places may be reduced by canonading only, eſpecially if they are large towns, very populous, and their inhabitants more numerous than thoſe of the garriſon; or ſhould the inconvenience not extend ſo far, it may at leaſt be acceſſory to their ſurrendering much ſooner than they ought to do, as furniſhing them with a ſpecious pretence or cloak for their own irreſolution or want of zeal for their Prince's ſervice.

Any eminence or elevation of ſituation above the horizon of the place, or any one part of it, is called a Commandment.

Of theſe there are ſeveral kinds;

Firſt, There are three, which take their names from the aſpects they bear to their oppoſite works, as the *Front Commandment*, the *Flank Commandment*, or that of *Enfilade*, in which direction every ſingle ſhot rakes the work throughout, and the *Commandment of Reverſe*, which overlooks the work from behind.

All theſe Commandments are dangerous, but the front Command leſs ſo than the enfilading one, as in the firſt the parapet covers the work. M. *de Vauban* made ſo ſlight of it, as ſeldom to raiſe the parapets either of the place or cover'd way higher upon this account, unleſs the Command itſelf was exceeding high. The Commandment of Enfilade is leſs dangerous than that of the Reverſe, as one or more traverſes may ſhelter thoſe within the work from the Enfilades; whereas againſt the Commandment of Reverſe there is no other means of defence but making a double parapet.

The particular effects of cannon with regard to the diſtance of their objects is a circumſtance concerning which all are not well agreed: Without entering into the detail of the queſtion, which would keep us too long, we ſhall here give three inſtances of the moſt material difference of their effects.

The firſt is of their effect at about 600 toiſes diſtance from the place of Command.

The ſecond of that at about 300 toiſes diſtance.

The third, at about 150 toiſes, a little more or leſs; that is to ſay, about the uſual diſtance of battering in breach.

Of theſe three kinds of Commandment the former only is to be diſregarded, the ſecond will demand ſome attention; for tho' the commanding eminencies are too far off for the cannon to ruin the ramparts entirely, thoſe within may be a good deal incommoded by them, eſpecially if they overlook the reverſe of the work. When *Louis* XIV. attack'd *Beſançon* the Citadel was expos'd to this inconvenience, and the effect of the cannon was ſo conſiderable notwithſtanding the diſtance that the beſiegers were driven from their defences.

Commandments in regard to their height are diſtinguiſh'd into the Commandment d'*Eſcharpe* and the plunging Commandment. The Commandment d'*Eſcharpe* is that whoſe line of direction forms an angle of twenty degrees with the horizon; the plunging Commandment that which forms an angle exceeding twenty degrees.

Some Ingineers diſtinguiſh theſe Commandments into ſingle, double, triple, quadruple, *&c.* in which diviſion of them every nine feet is eſteem'd a Command.

Their difference in point of extent is beſt expreſs'd by the number of cannon they are capable of containing in battery.

Their matter or ſubſtance, either of ſolid earth, ſtony ground, or rock.

Laſtly, in their degree of aſcent, they are either practicable or impracticable; that is to ſay, the getting up of artillery in the latter appears an impracticable thing: 'Tis not ſafe truſting to difficulties of this kind, which machines may overcome; but as we every day ſee cannon mounted upon exceeding high towers we ſhould rather believe the ſame thing practicable in regard to other eminencies, be their ſides ever ſo ſteep. The Caſtle of *Montmelian* paſs'd formerly for impregnable, becauſe, ſays *Mezeray*, 'tis ſeated on a high rock, ſteep on all ſides, its baſtions neither to be ſapp'd nor mined, its ditches cut with the edge of a chiſſel, and the ground all about it one entire rock, and cover'd by peeks of mountains, in appearance acceſſible only to the fowls of the air, ſo that there ſeem'd not the leaſt poſſibility either of making trenches or raiſing batteries.

In the year 1600 that Fortreſs being attack'd by the *French*, the Duke of *Savoy*, according to the Hiſtorian, promiſed himſelf that it would hold out for ſix months at leaſt, not doubting but the heart of *Brandis* the Governor was as good as his fortifications, and *Brandis* triumph'd as if already a Conqueror, thinking it utterly impoſſible to raiſe any batteries againſt him; but no ſooner had *Roſny* found means to plant them in five or ſix places (as what will not induſtry do for reward?) but the haughty Mar-

quis

quis ſuppled at once; a cloſe conference was held, with his connivance, between their two wives (his and *Roſny*'s) and his own fears increaſing every hour, the fourteenth of *October* he capitulated to deliver up the place the ſixteenth of *November* following, if not reliev'd by that time. This Caſtle was taken again by the *French* in 1693.

Before the year 1718 the *Danes* in like manner look'd upon the Fortreſs of *Frederickſtadt* as impregnable, ſtanding upon a high rocky eminence ſteep on all ſides, and before that front where it was leaſt ſo, being the only one where it can poſſibly be attack'd, ſtands Fort *Guldenleve* ſeated on the point of another high rock, and ſeparated by a valley of 200 or 250 toiſes wide, from ſeveral other mountains equally rocky and ſteep; on which mountains till then they thought it abſolutely impoſſible to raiſe batteries.

In the year 1677 the Marſhal *de Crequi* found means to draw cannon up the ſteep ſides of a precipice to batter the Redoubt or Fort on the ſummit of that mountain on the decline of which ſtands the Caſtle of *Fribourg*.

When we meet with ſituations which are commanded, in order to determine whether they are worth fortifying, the following particulars are to be conſider'd.

Firſt, Whether the ſituation be in the midſt, or on the border of a plain; or at the foot, or on the decline of an eminence, or on a hill or in a valley.

Secondly, How many its Commandments are? Whether a ſingle one only? or if more, their ſeveral aſpects in regard to the works they command, their diſtance, height, extent, ſubſtance, their aſcent and ways of approach.

Thirdly, It muſt be conſider'd whether the ſpace between the ſituation and the commandment is a continued decline to the place, or an horizontal plain, or ſome wide valley, or a river, or both together.

In regard to which circumſtances the ſentiments of the moſt able Ingineers are as follows,

If the ſituation is in the midſt or on the border of a plain, having one or two commandments, its diſtance from the place of command about that of battering in breach; the Command of ſmall height or extent, and of a ſoil eaſy to remove, ſo that there is a poſſibility of razing it without too great labour or expence; whatever the nature of the intervening ſpace may be, the ſituation may be fortified.

If thoſe commandments are of rock, impoſſible to be razed, but proper for the conſtructing ſome works on, and a communication is to be made betwixt them and the body of the place, it may likewiſe be fortified; of this kind is *Frederickſtadt* in *Norway*.

Likewiſe, if a ſituation be in the midſt or on the border of a plain, ſubject to a commandment at about the diſtance of 300 toiſes, of a height to batter *en eſcharpe*, and even to plunge into it, of a ſoil both for its extent and nature impoſ-

impoſſible to be razed, and of an aſcent practicable for artillery; tho' there be no poſſibility of taking in that commandment by a work of any kind, the ſituation may be fortified, eſpecially if there be a great river running betwixt that and the commandment, to render the approaches difficult on that ſide.

If the ſituation be at the foot of a mountain, whoſe higheſt commandment is within the diſtance of 300 toiſes, of a height to batter *en eſcharpe*, and to plunge into the works, and of an extent capable of containing a great number of pieces in battery, of a light ſoil and eaſy aſcent, it ought not by any means to be fortified.

The objections againſt it are ſtill ſtronger if the commandment loſes itſelf inſenſibly in an even eaſy ſlope, terminating at or near the counterſcarp of the place; becauſe whatever advanc'd works the beſieged might attempt to make during the ſiege, would be commanded by the works of the beſiegers. The latter, ſays the Chevalier *de Ville*, book I. chap. 4. will have this advantage, that they may place their batteries on what height they pleaſe; if the beſieged ſhould raiſe any work higher than ordinary to cover themſelves, the beſiegers can raiſe their batteries proportionably, which will ſtill command and look into the place, notwithſtanding any diligence of the beſieged to prevent it. Theſe kinds of ſituation are more faulty than thoſe whoſe Commandments are exceſſively high, ſteep, and cleft in ſuch a man-

ner as to leave no convenient deſcent, becauſe in the former the enemy has it in his power more eaſily to break in, and obſtruct the works, to make a breach and ruin the defences, as ſhot fired upon a level have a greater effect than thoſe fired from above; 'tis true, the higheſt Commandments can ſee farther into the place, and can more annoy the beſieged, as they are leſs in a capacity of ſheltering themſelves.

If a ſituation be on the ſlope or declivity of a very high mountain, and conſequently commanded on the ſide next the ſummit; this likewiſe ought not to be fortified but in caſe of extreme neceſſity. The Caſtle of *Sedan* is thus ſituated, but Marſhal *Vauban* has remedied that inconvenience with all that art could ſupply beſt adapted to the occaſion. Such likewiſe was the Caſtle of *Fribourg* before the ſummit of the mountain was taken in, by making ſeveral Forts one above the other.

If the ſituation be upon a hill commanded by a very high mountain, the intervening ſpace a valley, and the Commandment diſtant at leaſt 300 toiſes, it may be worth fortifying; but the ſituation would be better if a large river ran betwixt the hill and the Commandment.

If a ſituation be upon a high hill, rocky and ſteep, commanded by a mountain at a little within the diſtance of 300 toiſes, and there is a valley betwixt, it is not to be rejected; *Montmelian* is thus ſituated.

If the ſituation be upon a hill commanded on all ſides, that is to ſay, encompaſs'd with high mountains within the diſtance of 300 toiſes, it is more faulty than thoſe at the foot or on the decline of a mountain, and can never be well fortified; for do what you will, you can never be cover'd entirely, and on whatever ſide you ſally the beſiegers will have the advantage. The Chevalier *de Ville*, book I. part 1. chap. 4. ranks *Genoa* in the liſt of theſe ſituations.

He might in his time, but at preſent that City is ſurrounded with a double Fortification; the oldeſt and beſt of which juſt incloſes the City, the ſecond takes in the ſummits of all thoſe mountains which command it.

If the ſituation be in a valley commanded on all ſides by high mountains, whoſe deſcents extend as far as the ſituation, 'tis the very worſt of all, and ought not to be fortified on any account whatſoever. There are ſome Fortreſſes in *Rouſſillon* which have this bad ſituation.

SECTION IV.

Of the fourth Condition.

THE fourth condition of a ſituation, is, that it be difficult to attack by force, and eaſy to defend; that is to ſay, the ground without it neither proper for making trenches, nor batteries, nor mines, nor any works of that kind

kind which are neceſſary to oblige thoſe within to ſurrender. The extraordinary advantage attending ſuch a ſituation is, that it frequently affords the Sovereign an opportunity of ſaving expence in the conſtruction and keeping up of the works, and in the number of troops neceſſary to guard and defend them.

Dry land ſituations on an even plain, whoſe ſoil is good and eaſily removeable have by no means this condition; the trenches there are made with eaſe, a little depth of ſpade ſecures them, a little trouble makes the batteries, and they may eaſily be rais'd ſo high as to ſee and ruin all the defences, and demoliſh the buildings of the town. The eaſe and convenience of making theſe works have frequently occaſion'd the attack of one place preferably to that of another.

Hermanus Hugo in his relation of the ſiege of *Breda*, ſays, that the particular advantages to be found on the ſpot engaged the enemy to attack it rather than any other place; for that the ground of the environs was of the proper kind for conſtructing works of attack, and very convenient for making the line of circumvallation. The only advantage the beſieged can poſſibly receive from ſuch a ſituation is, that if they are very ſtrong and numerous in cavalry they may the eaſier make ſallies on the beſiegers. Notwithſtanding the conveniences which ſuch ſituations afford the latter, yet as they admit of giving the Fortreſs whatever form is thought moſt proper, even the moſt perfect, a regular one;

one; as the goodneſs of the ground facilitates the making large ramparts, and raiſing them to any height required, the making the ditches wide and deep, the forming a good cover'd way, large and ſtrong baſtions, raiſing high and ſpacious cavaliers; in ſhort, as they furniſh the means of putting in practice all that art or induſtry can invent or execute for their defence; for theſe reaſons moſt Ingineers are for allowing their ſituations as good, provided they have the other conditions abſolutely neceſſary, that is to ſay, good air, good water, and good food, and the ſecond in a ſufficient quantity, *&c.*

Situations on a plain have the condition preſcribed in this Section,

Firſt, When you cannot go ſix inches downwards without meeting water.

Secondly, When the environs are of a ſandy ſoil, as generally happens near the ſea-ſhore.

Thirdly, When the ground is full of large ſtones, flinty and hard, or ſtill better if a rock unvein'd, without the leaſt ſprinkling of ſoil.

Situations on a broken plain partake ſtill leſs of this condition than thoſe upon an even one, as they afford the beſiegers an opportunity of approaching the place nearer, and under cover.

All ſituations on mountains of eaſy declination, the ſoil either all earth, or a mixture of earth and ſmall ſtones, have by no means this condition; but if they are all of maſſy ſtone or rock from the mountain-ſummit to about 100 toiſes

toiſes beyond the glacis, they are exceeding good, provided they have the other conditions. The more even and continued the ſurface of thoſe rocks, and the freer from cavities, the better the ſituation, as the beſiegers will be thereby neceſſitated to carry the greater quantity of materials thither to cover them in their approaches. Situations amongſt rocks which ſhoot upwards in points, forming wells or bottoms from ſpace to ſpace, are not ſo good; becauſe thoſe bottoms greatly ſhorten the labour of the trenches, being ſo many ſmall places of arms ready made, where the troops are in ſafety; where theſe are found all that is wanted is to carry materials ſufficient for making a communication from one to the other, which will not need a parapet of any great thickneſs, as the troops are not to remain behind it, but only to paſs through. Theſe ſituations are very frequent in *Norway*; ſuch is that of Fort *Guldenleve* and of *Frederickſtadt*, where experience has taught us, that trenches are to be carried on almoſt with as much eaſe as on an earthy ſoil.

It is here neceſſary to obſerve that by a mountain of an eaſy declination we mean ſuch a deſcent as forms an angle of about 15 degrees with the horizon; by a mean declination one that forms an angle of about 30 degrees, by a ſwift and rapid deſcent one that forms an angle of 45 degrees at moſt, and by the term *eſcarpant* or declivity, one forming an angle exceeding

ceeding 45 degrees, where it is not only impoſſible to carry trenches up it, but even to mount a ſtep.

Situations on a mountain of a mean declination, if not of maſſy ſtone or rock, are even more faulty than thoſe of an eaſy one, becauſe in the former the approaches may be more boldly carried up, being leſs in view of the cannon of the place, and riſing ſtill under cover even to the paliſade; or if cannon are not to be made uſe of without much difficulty, mines will anſwer the ſame purpoſe with greater eaſe.

Situations on very high mountains, and of a ſwift and violent deſcent, altho' of earth only, have this condition; as the carrying on trenches there would be a work of great difficulty from the great ſtones and ſhells the beſieged might roll down upon them continually, and the great trouble they would find in getting up their artillery, which would not eaſily be brought to bear; and that the breach when made would always be of a very ſteep aſcent, and conſequently eaſy to defend; for which reaſon ſuch aſſaults ſeldom ſucceed. Such is the ſituation of *Sancerre*, which was fortified formerly.

The Ancients look'd out for ſuch ſituations to fortify them, becauſe of the great trouble and difficulty they put the beſiegers to in craneing up their engines to apply them to the walls of the towers, ſuch as their battering rams, their tortoiſe, and other military machines they had,

to

to burſt and tumble down the walls, and open themſelves a paſſage into the place. *Mezeray* ſays, that towards the year 995, moſt Caſtles and Fortreſſes were built upon the brows of mountains; that *Laon* was reckon'd one of the moſt important at that time, on account of its ſtrong ſeat upon a mountain, being as it were the Donjon of that Royalty. It is evident that when ſituations of this kind are full of large ſtones, or an entire rock, they are ſtill better.

Situations on mountains, or on very high hills, form'd all of one maſs of ſtone vertically and horizontally cloven and interſected on all ſides, are impregnable by force; they may likewiſe be very good, tho' not precipiced on all ſides, eſpecially when there is no way for the beſiegers to get up their artillery, and only one narrow winding path of aſcent. Fortreſſes of this kind are not to be approach'd by trenches; there is no ſuch thing as ruining their defences, to mine them is impoſſible, being all of ſolid rock, or to make a practicable breach with cannon; of this kind is the Caſtle of *Bouillon* in *Ardenne*, *Verrogala* in the territory of *Piſa*, and *Radicofani* in *Tuſcany*, on the frontier ſide of the Eccleſiaſtick State.

M. *Vauban* had not ſo great an opinion of theſe latter ſituations, as of thoſe on a moraſs. See what he ſays in his Memoirs of the conduct of ſieges, concerning them. Places ſituate upon a rock altho' difficult of acceſs are not

near

near ſo troubleſome to attack as thoſe on a wet moraſs, where there is no coming at them but by cauſeways; and this for ſeveral reaſons,

1. Becauſe they are generally leſs in themſelves, have but a narrow front, and conſequently little oblique command of their avenues.

2. Becauſe their avenues are ſeldom or never ſo ſtrait as thoſe of a cauſeway made by hand.

3. If any of them happen to be ſo, which is a thing very rare, they are at leaſt very ſhort, which renders the approach more eaſy, and better to be ſuſtain'd, as it aids the bringing up of the cannon.

4. That if any are of a greater length, there is always ſome place or opening wider than the reſt, where a lodgment may be extended and batteries ſeated to play upon their narrow fronts, which are generally ill terraſs'd, and from whence you will be able with eaſe to clear all obſtructions in the approaches.

5. That the difficulty of getting either in or out is no leſs to the beſieged, than that of coming at them to thoſe who attack.

6. That thoſe places, being generally inconſiderable, are apt to have but one avenue, in which caſe 40 men have it in their power to block up 30, and if they pleaſe may ſtarve them to death.

7. That if they ſhould have ſeveral, as they can contain but a ſlender garriſon, they are never the more conſiderable.

8. That

8. That places on a moraſs, with which there is no communication but by cauſeways, altho' they have much the ſame inconveniencies, 'tis not in a manner ſo diſadvantageous, becauſe they have uſually a greater number of avenues, and the moraſſes are never ſo inacceſſible but that either boats or foot-men may ſlip acroſs into the place.

Situations in valleys are difficult of attack by force, when there is no opening the trenches in the ground without the works, but with great difficulty; being either a mixture of flinty hard ſtones, or all of ſolid rock.

Aquatick maritime ſituations (as thoſe on an Iſland) in general are difficult of attack by force, provided that if they lie low they are at ſuch a diſtance from the land, as not to be within the reach of a breach battery from thence; or if they are within that diſtance, are on a rock ſo eminent and ſteep, that the breach can never be made practicable: Both theſe kinds of ſituations are good, but the ſecond infinitely better than the firſt, as both in one and t'other the troops muſt be carried to the aſſault in flat-bottom'd boats.

The great difficulty in the attack of the former, is the making breach with batteries upon the water, that is to ſay, with cannon on boats or floats; this, tho' troubleſome, is not impracticable, provided you can get a number on board ſuperior to thoſe in the place; in the ſecond caſe, the ſituation being ſuppoſed to be very high

high and ſteep, the breach, tho' eaſy to be made, is never to be made practicable; ſo that you may hope to carry the former as ſoon as the breach is made, but muſt never expect to ſucceed in the latter, unleſs the beſieged are deſtitute of proviſion, or ſurrender through ignorance of their own ſecurity.

Low aquatick maritime ſituations to be good, muſt be of no greater extent than for the whole ſpot to be covered with the Fortifications, or if any part be left out, it muſt be ſo hemm'd in betwixt the works and the water, that the ordinary Garriſon protected by the fire of thoſe works may be able themſelves alone to oppoſe and prevent any debarkment of the enemy, or their ſetting one foot a-ground; if that is not the caſe, or the ſpace left out ſufficient to contain a ſmall army, it will be neceſſary in wartime to keep ſuch a body of troops there as may effectually prevent any deſcent, and thus the ſituation will be no more advantageous than if it were a plain on the Continent; for when once the enemy has got poſſeſſion of the ground, and has ſettled himſelf there, he will form his attack in the ſame manner as at the ſiege of a dry-land ſituation, and will have the convenience of the water beſides to bring him whatever he has occaſion for.

When ſituations are very high, ſteep-ſided, ſurrounded with the ſea, and yet ſo near the ſhore as to be within reach of a breach battery from thence; not to be liable to be

taken, the arm of the ſea which ſeparates them from the main-land muſt be of ſuch a depth that there be no poſſibility of coming at them by a dyke or cauſeway made there for that purpoſe; ſuch a one as was made by *Alexander* at *Tyre*, according to *Quintus Curtius*, Lib. I.

Amongſt theſe aquatick Maritime ſituations, ſome are to be found with ſuch ſingular circumſtances as render them impregnable; as *Venice*, which it is impoſſible to come at either by ſea or land: it is ſituated in the midſt and at the extremity of the *Adriatick* ſea, on ſeveral ſmall iſlands, which have been form'd in a long tract of time by the ſlime of the ſea, and are ſeparated from one another only by little canals; its diſtance from the Continent is about four miles; there is no ground about it but what is covered with buildings. This great city has neither walls nor ramparts, but is beaten by the waves on all ſides, ſtanding firm on its piles as if ſeated on a rock; the water which flows round it is of little depth, for which reaſon, notwithſtanding its extent, it goes by no other name at *Venice* but that of the Lake.]

On the eaſt ſide of the harbour lie ſeveral little Iſlands which cover it, and before you arrive there you are obliged to paſs by ſeveral Forts which ſtand in the ſea; nor would any veſſel ever find the way, did not the people themſelves ſhow them the paſſages, which change from time to time with the ſhifting

ſands.

ſands. Its great misfortune is, that the depth of the Lagunes has been decreaſing for ſeveral years paſt, notwithſtanding all the diligence uſed to prevent it, ſuch as mills and other machines for throwing out the mud and ſlime which is conſtantly gathering, and which appears above water in ſome places when the ſea is quite low.

They have turn'd on one ſide the mouth of the *Brenta*, and of ſome other rivers, to prevent their bringing ſoil and ſand into the Lake, leaſt the earth ſhould get the upper-hand of the water again at laſt, as it has done at *Ravenna*, which would be moſt prejudicial to *Venice*, whoſe ſtrength and ſecurity conſiſts wholly in her ſituation.

If it ought to be the inceſſant care of that City to keep up the waters which ſurround her juſt ſo high as that ſhe may never more join the Continent, it would be by no means for her advantage to have thoſe waters every where of a general and uniform depth; becauſe while things continue nearly in their preſent ſtate it is next to impoſſible to attack *Venice* either by ſea or land. 'Tis to this advantageous ſituation, according to Hiſtorians and Politicians, that famous City owes its eſtabliſhment, preſervation and aggrandiſement. See what *Machiavel* ſays in his Political Diſcourſes. 'The origin of '*Venice* is owing to an aſſembly of diverſe na-'tions, who had retreated into ſeveral little 'Iſlands lying at the extremity of the *Adria-*

'*tick* Gulph, for ſhelter from the wars which 'raged in *Italy* (after the declenſion of the '*Roman* Empire) by the frequent irruptions of 'the Barbarians. Theſe numerous Refugees 'having no particular Prince to govern them, 'began by mutual agreement to ſubmit to ſuch 'laws as ſeem'd beſt ſuited to their own pre-'ſervation. Things ſucceeded with them ac-'cordingly, the advantage of their ſituation 'procuring them a long repoſe; that ſea having 'no outlet, nor the Barbarians any ſhips to 'diſturb them; and in this manner from ſo 'minute an origin they have rais'd themſelves 'to that pitch of grandeur they enjoy at pre-'ſent.' Another Author ſays ſhe owes her riſe to the *Paduans*, who about the year 421 retired into the Lagunes of the *Adriatick*, for fear of the *Goths*, where lay a number of ſmall Iſlands inhabited only by fiſhermen, the chief of which was called *Rivalta*, where the *Paduans* firſt ſettled themſelves; but *Attila* King of the *Huns* having deſtroyed *Aquila*, *Altino*, *Concordia*, *Odezzo* and *Padua*, the people of thoſe towns retired likewiſe into the Iſlands in the year 453, and there fix'd themſelves; ſo that it is from thence we ſhould properly date the founding of that City, which afterwards gradually increaſed till it became the Capital of a powerful Republick.

Mezeray ſays, that 'in the year 452 the 'terror of the arms of *Attila*, after he had 'taken *Aquila*, driving all thoſe people out of

'their

'their country, ſome bands of them threw
'themſelves into the Iſle of *Rialto*, and other
'neighbouring Iſlands, who there fixing their
'habitations, became the firſt founders of that
'noble State. That Hiſtorian ſays afterwards,
'that in the year 305 the city of *Venice* was
'not as then built: And that the ſeventy-two
'Iſlands which compoſe it, with the country
'and towns upon the borders of the Gulph,
'were govern'd by two Tribunes, whoſe power
'were equal to that of the Duke. Their names
'*Beat* and *Obelier*. He adds, that in the year
'310. *Pepin* the ſon of *Charlemaigne*, exaſpe-
'rated at the double-dealing of *Maurice* and
'*John*, Dukes of *Venice*, who openly favoured
'the *Grecians*, and being deſirous to re-eſtabliſh
'*Obelier* and *Beat* who had been expelled, ſal-
'lied out of *Ravenna* with his fleet, and en-
'tered the lake of *Venice*. He ſeiz'd at once
'upon all thoſe little Iſlands upon the borders
'of the Lake, and afterwards ſteer'd towards
'the Iſland of *Mamaluc*, the ſeat of the Duke,
'which he had abandon'd, and ſeiz'd on it like-
'wiſe; *Maurice* and his ſon *John* having with-
'drawn themſelves into thoſe of *Rialto* and
'*Olivola*.

But according to the *Venetian* Authors, that Prince attempting to attack thoſe Iſlands with his flat-bottoms, whilſt the Duke's army was defending them, it happen'd that for want of being acquainted with the depths and ſhoals his fleet ran a-ground; where great numbers of the

French were kill'd or ſtifled in the mud; and himſelf, who had made a deſcent on *Mamaluc* with the leaſt party of his troops, retired in great confuſion to *Ravenna*, ſending away *Obelier* and *Valentin*, who had unadviſedly engaged him in the enterpriſe,

'Tis about 300 years ſince the *Genoeſe* met with the ſame reception.

In that Iſland of *Rialto* a palace for the Duke was built ſoon afterwards, and another in *Diolivolo* for the Biſhop, and thoſe ſeveral little Iſlands in time had a communication made with each other by bridges, all which together compoſe the city of *Venice*, ſo renown'd for its famous ſituation, and ſo much more for its wiſdom and conduct.

Situations upon a Lake are good againſt attacks of Force, provided they have the principal conditions already ſaid to be neceſſary in thoſe upon the ſea, as *Mantua*, which is ſurrounded by a Lake on all ſides, and is at the extent of cannon ſhot or farther from the ſhore.

Situations in the midſt of a great river are in like manner good, provided that if they lie low, the branch of the river exceeds the diſtance of battering in breach; otherwiſe by raiſing batteries on the oppoſite ſhores the defences might be ruin'd and the place laid open, or Cavaliers rais'd to command the inſide, and when the breach is made, the troops go in flat-bottom boats to the aſſault. It is likewiſe neceſſary that there be no poſſibility of diverting the courſe of

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the river, nor the Iſland liable to be flooded, or its fortifications damaged by any occaſional ſwell of the water, in which laſt caſe the keeping up of the works would be an endleſs expence. If theſe Situations were upon high rocks and precipiced on every ſide, tho' within cannon ſhot from the ſhore, they would be good notwithſtanding; as *Rochemaure* and *Chateau d'Ais*, which both ſtand in the midſt of the *Rhone*.

Amongſt the common or mixt Situations many are difficult of attack by force; as thoſe ſtanding on the brink of the ſea, whoſe flux at times covers the ground where the attack ſhould be form'd; as *St. Michael* in *Bretaigne*, which ſtands on a maſs of inacceſſible rock on the ſea ſhore, where at high ſea it is environ'd all around with water, at low ſea is a bare ſtrand; ſo that 'tis neither to be attack'd by land nor water, the rock on that ſide is ſo ſteep.

Situations on Peninſula's in the ſea are alſo difficult of attack by force, when they are not to be come at but on a narrow front, well fortified, and not to be inſulted by an enemy; that is to ſay, not without difficulty acceſſible. Such ſituations are as good as any whatſoever, provided their extent of water exceeds a cannon ſhot from the ſhore, and their communication with the continent is narrow and ſtrait; in this manner ſtands *Portoferara*, for the moſt part ſurrounded by the ſea, and ſeparated by an artificial bridge from the land: In this number

we may place *Valetta*, a town of the Iſland of *Malta*, whoſe communication with the *Terra firma* is by a ſpace of rock 360 toiſes wide in front, where they have unskilfully heap'd work upon work, many of which might be more uſefully employ'd in places at preſent neglected, and which deſerve ſome attention. One half of thoſe works in the front, on a ſpot the moſt favourable for an attack, would put a skilfull and experienc'd Ingineer to a ſtand, before he engaged with them.

Peninſula-ſituations upon the borders of a Lake are likewiſe very good; ſuch is *Orbitello* belonging to the State of *Sienna*, ſtanding in the midſt of a lake, and join'd to the continent by a narrow iſthmus only, the only way by which it can be attack'd.

Peninſula-ſituations on the ſhore of a great river are like thoſe on the border of a lake.

A mixt ſituation of the maritime kind, where there is an efflux and reflux is difficult to be attack'd by force, when the country all around it being a flat and lower than the ſurface of the high ſea, it may be overflowed either by cutting the dykes which ſuſtain the water, or by ſluices made for that purpoſe. There are ſeveral maritime towns in the *Low Countries*, which are reckon'd very ſtrong ones on account of this circumſtance only.

A mixt ſituation ſtanding on a river ſide, or through which a river paſſes, is difficult of attack by force,

Firſt,

Firſt, When having a flat country all about it, lying lower than the bed of the river, and without any outlet, by making ſeveral cuts in the banks the waters may be thrown upon thoſe parts. Theſe kinds of ſituation are very rare; nature alone cannot form them without the aſſiſtance of human induſtry.

Secondly, When thoſe environs lye lower than the ſurface of the river, a part of it may be drawn off to overflow them.

Thirdly, When thoſe environs lye a little higher than the ſurface of the river, by making ſluices ſecur'd from the enemy, the courſe of the water may be ſtopp'd, and the environs overflow'd.

For theſe inundations to be perfect, the channel thorough which they are to be conducted on their return to their bed, whether natural or artificial, muſt be very high bank'd, and of a ſoil exceſſively difficult to cut, that the attempt may be almoſt impracticable, at leaſt a work of conſiderable time and expence. Situations of this kind are not common any more than the two preceding ones, but are extremely advantageous; becauſe as thoſe parts which are cover'd by the water require but little fortification, the greater expence may be afforded in fortifying the reſt.

Situations whoſe inundations are liable to be drain'd are ſometimes good notwithſtanding, as

Firſt, When the head of the drain may be ſecur'd by making ſome very ſtrong work there.

Secondly,

Secondly, When the inundation itſelf is of ſuch a depth and extent as to require a long time for its diſcharge.

Thirdly, When the river may replace the water faſter than it is carried off by the drain.

Fourthly, When the inundation is capable of being drawn off in part only, and a ſufficient quantity of water is left behind to render an attack extremely difficult.

Fifthly, When tho' the whole may be drain'd, the bottom is ſo foul that it would be a work of vaſt labour and difficulty to carry on an attack there.

On the other hand, a ſituation on a river ſide, or thorough which a river paſſes, is of no kind of value when it is in the power of an enemy either by opening a dyke, or ſtopping the courſe of the water, to drown the buildings and the works of the place. 'The *Lacedemonians*, ſays *Frontin*, made themſelves maſters 'of a town by carrying a dyke acroſs a river 'which ran through the midſt of it, by which 'means they rais'd the water ſo high that it 'ſapp'd the foundations of the houſes and the 'walls of the place.'*

Dogen reports, that the town of *Brunſwick* being attack'd, and the beſiegers having loſt all hopes of taking it by force, they bethought themſelves of making a dam acroſs the *Onacre* to ſtop it, and overflow the City; and the

* Lib. II. cap. 13.

event

event would have anſwered their purpoſe, but that the dyke happening to give way, the river return'd into its ordinary bed.

A ſituation travers'd by a river, tho' otherwiſe ever ſo good, is good for nothing if there is a poſſibility of diverting the courſe of that river, and the bed affords an eaſy ground for an attack. ' *Alexander*, when he beſieg'd *Baby-*
' *lon*, which is parted in two by the *Euphrates*,
' took the town by means of the river only;
' which he laid quite dry, by giving a new
' courſe to the water. 'Tis ſaid *Semiramis* had
' done the ſame thing before him.

A common ſituation on a river is difficult of attack by force where the prevalence of certain ſeaſons may interrupt the meaſures of the beſiegers; as when 'tis environ'd with rivers, brooks, or torrents, which after heavy rains overflow their banks, and lay the environs under water. When ſituations of this kind are to be attack'd, it is abſolutely neceſſary to conſult the ſeaſons on the occaſion, and take the proper time for doing it. The year 1647, the Duke of *Modena*, General of the *French* army in *Italy*, was obliged to raiſe the ſiege of *Cremona*, having undertaken it in too advanc'd a ſeaſon for a country where the rains ſetting in betimes overflow the rivers, and make the ways impaſſable for convoys.

The town of *Graves* 'tis ſaid, is only to be attack'd in the ſummer ſeaſon, becauſe from the latter

* *Frontin.*

latter end of *Auguſt* to the beginning of the ſpring the environs are all cover'd with water and inacceſſible, even thoſe places where the beſieging army muſt neceſſarily encamp.

Were *Perpignan* to be beſieged at any other time, they muſt run the hazard of being forc'd to raiſe the ſiege, for the torrents which run down from the mountains upon the firſt rains in Autumn ſwell the river *Latet* ſo high, that it overflows its banks, and drowns a part of the environs of that city. The ſame thing commonly happens in winter and in ſpring.

On the contrary * *Coni* in *Piedmont* is only to be attack'd in winter, becauſe of its high ſituation and being environ'd with two torrents, which ſometimes in the other ſeaſons, eſpecially in the great heats of ſummer, are ſwoln to ſuch a degree, that the valley underneath is cover'd with water, and that with ſo rapid a current there is no ſetting up any bridge to paſs.

A common ſituation on a river is difficult of attack by force, when there is an opportunity of making the ditches of the place very deep and well flank'd, and thoſe may either be fill'd with water or turn'd dry upon occaſion: This may be put in practice when the bed of the river from its firſt entrance to its going off from the town lies on a very conſiderable deſcent; for by making one ſluice at the river's entrance,

* Chev. *de Ville*, liv. II. part. 2. chap. 13.

another

another ſomething higher on the ſide of its communication with the ditches, and a third in the ditch itſelf, oppoſite to where the river goes off from the town; then ſhutting the upper ſluice of the river, and opening that of its communication with the ditch, the ditches will be fill'd with water; and by ſhutting the upper ditch ſluice and opening the lower, you may lay them dry again: or, by keeping the ſluice of the river ſhut, and leaving open thoſe of the ditches, the river will take its courſe through the ditches, and you may have a conſtant current of water.

Theſe large currents or effluxes of water in the ditches are of excellent uſe and defend admirably well the paſſage of the ditch; but for this purpoſe they muſt receive their ſupplies from plentiful rivers, for if they draw them from inundations of great extent, and which have been a long time form'd, it may ſo happen that after opening the ſluices which ſuſtain'd them, you may find it difficult to ſhut them again, in which caſe the beſiegers need only deſiſt from their attempt till ſuch time as the reſervoir ſhall have entirely emptied itſelf.

This inconvenience however may be remedied by making ſeveral ſmall ventils, and not opening them all at once; in which caſe likewiſe it will be eaſier to ſhut them again, if you find the enemy diſpoſed to expect ſuch event.

As to any other reſources of water retain'd for this purpoſe of being let looſe into the ditch;

when

when their product is not very conſiderable, it happens that in paſſing through ſeveral ſluices in a direct line, the torrent they form is quickly gone; or if in order to lengthen it they are made to paſs thorough one ſluice only, they are no ſooner thro' the gate but meeting with a larger expanſe of water they loſe their activity, and are of no farther effect to the purpoſe intended of obſtructing the paſſage of the ditch, or carrying away the works made there by the enemy. To render them capable of this effect, a third ſluice muſt be made as was ſaid before; to wit, at the return of the water of the ditch into the bed of the river, by means of which the ditch may be kept quite full till the enemy has compleated his works for the paſſage, and which being then open'd will carry all away with the torrent.

Theſe ſituations are good when at the time of an attack they are in ſuch skilfull hands as know how to make the beſt uſe of them, but in our days we have ſeldom ſeen the beſieged reaping thoſe full advantages from them of which the places themſelves were capable.

The year 1697, the paſſage of the ditch of *Ath* might have been attended with very great difficulty, if the beſieged had but known how to make uſe of thoſe advantages which were to be found upon the ſpot; that vaſt body of water form'd by the inundation of the upper *Dender*, might have been ſent down upon us with ſuch torrents through the ſluice, when the ditch was full, and we buſy about our paſſage, as muſt have

have broke down and carried away all our bridges, had the use of it been in skilfull hands.

To know how to avail one's self in the best manner of these advantages in a situation, as well as of inundations, is an art and study of it self, requiring a particular application, and not only that but a perfect knowledge of the level of the ground.

Situations on a moras are difficult of attack by force, provided they are not to be drain'd by any canal made by the besiegers, or that some Fort may be built to prevent it. The attack of places on such a situation is difficult because to open the trenches in a moras;

First, The earth and the rest of the materials must be fetch'd from far, as was done heretofore at the siege of *Bolduc*, and which is not to be done without abundance of labour, expence, and the loss of many people.

Secondly, There is no getting up artillery thither to raze the defences, particularly the flanks, which makes the passing of the ditch almost impossible.

Thirdly, The making batteries is a work of great difficulty, and there is no such thing as making mines.

Philipsburg in the *Palatinate*, *La Fere*, *Peronne* in *Picardy*, *Marsal* in *Loraine*, *Coevorden* in *Over-yssel*, &c. are thus situated; the latter of which passes at present for one of the strongest in *Europe*.

Their

Their diſadvantage with regard to an attack is, that in a cold country they are liable to be ſurpris'd in time of froſt, as *Coevorden* was in the year 1673: This defect may be remedied by paliſading the place all around, and keeping the ice conſtantly broke in the middle of the ditches.

M. *Vauban* prefers this kind of ſituation to one upon a very high rock.* Places ſurrounded with water, or with a moraſs with a watery ſurface, ſuch as are not to be come at, but by narrow cauſeways, and have but little earth about them, are beyond diſpute, of all others the moſt difficult to attack, the rather as,

Firſt, You are croſs'd and involv'd on all ſides by the fires of the place.

Secondly, You can neither extend to the right nor to the left.

Thirdly, You are forc'd to be continually enfiladed.

Fourthly, The ſeating your batteries is a work of abundance of difficulty.

Fifthly, They are of very little effect, and hard to be maintain'd, againſt all the oblique fires of the place.

Sixthly, Becauſe it is an eaſy matter to give a much greater extent of front to works ready made and prepared before-hand than can be given to new ones advanc'd againſt them; and the former having before taken all the advantages of ſituation, if the beſieged are as reſolute as they

* *Memoires manuſcrit ſur la conduite des ſieges.*

they ought to be in their defence, the beſiegers will not be able to advance one ſtep.

So that if there are ſuch things as impregnable places, in all appearance their ſituation muſt be like thoſe we are now ſpeaking of; others tho' never ſo lofty and even ſeated upon a rock, tho' of difficult acceſs are not near ſo troubleſome.

Mixt ſituations ſhut up and bounded by canals on all ſides have likewiſe their difficulties when attack'd by force, and conſequently thoſe which are ſurrounded partly by canals and partly by moraſs; as *Ferrara*, which on the ſide of *Bologna* has great moraſſes, and on the ſide of *Venice* large canals, the works of art made by turning the waters of the *Po*.

Section V.

Of the fifth Condition.

THE fifth condition of a ſituation is, not to be beſieg'd without much difficulty; this is the caſe, when accompanied with the advantageous circumſtances following,

Firſt, When it is a hard matter to prevent its receiving ſuccours.

Secondly, When it is equally difficult to prevent a part, or the whole garriſon from ſallying.

Thirdly, When the beſieging army muſt be hard put to it to get every thing neceſſary for their ſubſiſtance during the ſiege.

The firſt of theſe three circumſtances is abſolutely neceſſary, becauſe all Fortreſſes, tho' never ſo ſtrong muſt fall into the hands of a powerful enemy at laſt, if they cannot receive ſuccours from their Sovereign.

Succours are either particular or general.

Particular ſuccours are ſuch things as the beſieged ſtand moſt in need of (as men, arms, ammunition, proviſions, *&c.*) to prolong the defence, and repulſe the enemy.

General ſuccours, are the marching ſuch an army thither, as may be able to give battle to the beſiegers, and force them to raiſe the ſiege.

We ſhall now proceed in the firſt place to ſpeak of the ſituations moſt convenient for throwing particular ſuccours into them, and afterwards of the general ones.

Of dry-land ſituations thoſe upon an even plain are eaſily to be ſuccour'd on all ſides, becauſe in order to take up their quarters out of the reach of cannon-ſhot from the place, the beſieger's line muſt be greatly extended, and conſequently their quarters either weakly guarded, or at a greater diſtance from each other.

Situations on a broken plain are, for this reaſon, not ſo eaſily ſuccour'd, as the beſieging army under favour of the riſing grounds, brows of hills, and hollow bottoms, have an opportunity of drawing very near the place with

their quarters, and of lying but at a ſmall diſtance from each other, which conſequently makes it difficult for ſuccours to paſs betwixt them.

Places ſituate upon a mountain of an eaſy declenſion in the midſt of an even plain are more eaſily ſuccour'd than thoſe ſtanding on the plain itſelf, becauſe the beſieging army, not to be diſturb'd by the cannon of the place, muſt take up their quarters at a ſtill greater diſtance than the former, by which means they become farther ſeparated from each other, and conſequently give an eaſier opportunity for ſuccours to ſlip betwixt any two of them into the place.

It is very difficult throwing ſuccours into places ſituate upon mountains, or in mountainous countries, as the enemy can eaſily draw near the place with their quarters; as the ſuccours cannot eaſily paſs over thoſe mountains, and the beſiegers may eaſily ſecure the paſſes by keeping a good guard in them.

There is no throwing ſuccours into Places ſituate upon ſteep rocks without abundance of trouble, as their entrances being but few they are eaſily block'd up; for which reaſon thoſe places are eaſily taken by famine.

Of aquatick ſituations, thoſe in the midſt of the ſea, at about half or three quarters of a league's diſtance from the land, ſeated on a rock or ſmall iſland, with a good port and eaſy entrance, have great convenience of receiving

ſuccours; becauſe light ſailing veſſels firſt fetching the wind, and then with all their canvas ſpread, ſtretching for the port, it would be a very difficult matter for the ſtrongeſt fleet of an enemy to intercept them.

Situations in the midſt of a great Lake partake of this advantage, but in a leſs degree than the former; as the ſuccours muſt come by land to the lake ſide, and there have veſſels ready, ſent from the place to receive them, or the beſieging army not maſters of all the borders: In general, ſuccours are not ſo eaſily got in there as into thoſe ſtanding in the ſea; for which reaſon there is a neceſſity of always keeping up a good garriſon in them, with ſtore of proviſions.

Situations in the midſt of a large river are likewiſe eaſily to be ſuccour'd, provided the enemy is not abſolutely maſter of both ſhores, or that if he is ſo he cannot make other Fortreſſes above them to cut off the communication by water.

Common or mixt ſituations are eaſily to be ſuccour'd, when ſtanding on the ſea ſhore with a good port to them; as to form ſuch a ſiege both an army and a fleet will be neceſſary, and therefore if not by land they may at leaſt be ſuccour'd by ſea, ſuppoſing the harbour ſecure and ſpacious. Places ſo ſituate can hardly be ſo cloſely beſieged but that ſometime during the courſe of the ſiege they may beat off the enemies fleet with their artillery, and give opportunity

portunity for a few barks to get in with refreſhments; it was by means of this advantage that *Oſtend* formerly ſuſtain'd a ſiege of three years and ſeventy-eight days.

The Arch-duke began the ſiege the fifth of *July* in the year 1600, the famous *Ambroſe Spinola* put an end to it the twentieth of *September* 1604, having the honour to reduce that place to capitulate. It had that advantage of being capable of receiving ſuccours by ſea at any time; ſo that as ſoon as the garriſon was fatigued, it was ſent out and a freſh one taken into the place; by this means the beſieged were enabled to diſpute every inch of the ground, and did not ſurrender till they had not earth left to cover them.

At the ſiege of *Candy* it was not in the power of the *Turks* to prevent the town's receiving ſuccours continually. When a ſituation of this kind ſtands upon high ſteep rocks, a better need not be deſired, provided it has the other neceſſary conditions. We forgot to take notice that the entrance of the harbour muſt be wide and deep, that it may not be in the power of the enemy to ſtop it up, either by ſinking ſhips there, or by making a dyke acroſs it, as *Louis* XIII. did at *Rochelle*.

Situations on the border of a great lake have this advantage in part only, not in the ſame degree as the preceding ones.

If a common ſituation be on the border of a great rapid river, as the *Po*, the *Rhine*, the

Danube, &c. it will have ſome ſmall ſhare only of this advantage; becauſe a powerful and skilfull enemy by throwing two bridges over the river one above and the other below, may block up the paſſage and prevent the arrival of any ſuccours: According to the relater of the ſiege of *Breda* the beſiegers by ſome means of this kind cut off all ſuccours from that garriſon both of ammunition and proviſions.

The year 1676, *Philipsburg* being beſieged by the Imperialiſts could never receive any ſuccours, the beſiegers having uſed the ſame precautions as were taken at *Breda*.

If ſuch ſituations give the beſieged great advantages in the article of receiving ſuccours, they are no leſs favourable to the beſiegers in affording them an eaſy conveyance for neceſſaries of all kinds both for the ſubſiſtance of their army, and for the carrying on of their attacks, which counterballances the advantages of the other ſide; But when thoſe in the place are ſuch abſolute maſters of the rivers that the others cannot cut off their communication theſe ſituations are extremely good; ſuch are thoſe of *Bommell*, *Bois-le-duc*, *Bergen-op-zome*, &c.

As to ſituations upon inundations form'd by ſeveral ſmall rivers, 'tis difficult throwing ſuccours into them, unleſs either the inundation be of a ſmall extent and the whole fordable, or elſe ſo deep as for boats to paſs, and of thoſe a ſufficient number in the place; in which caſe, the more extenſive the inundation the eaſier the oppor-

opportunity for the ſuccours, as the line of circumvallation muſt become thereby more extenſive, and conſequently either a great number of troops required to form the line compleat, or the line more weakly guarded, and by that means an opening given for ſuccours to paſs; ſuch would be the ſituation of the environs of *St. Omers* on the ſide next *Flanders* if *Waten* ſluice were ſecured by ſome good Fort.

'Tis exceeding difficult throwing ſuccours into places on a marſhy ſituation, becauſe they have ſeldom more than one or two narrow ways of approach, which may eaſily be ſtopt up by a ſmall Fort or two; they are likewiſe eaſily to be taken by famine, and by a very ſmall number, unleſs the moraſs be paſſable.

'Tis alike difficult throwing ſuccours into a place whoſe environs are interſected by large canals.

'Tis eaſy raiſing the ſiege of a place when ſtanding in a flat country, and ſtill eaſier when upon an eminence in the midſt of a large even plain, where the beſieging army to encamp out of the reach of cannon ſhot are obliged to extend their line of circumvallation to an extraordinary degree, and have no opportunity of contracting it.

On the other hand 'tis difficult to raiſe the ſiege of a place, when ſituate upon a broken plain, where the beſieging army can draw very near to ſtraiten it with their quarters; or on ſome advantageous riſing ground, having cavins, hollow ways, or deep tracts worn by torrents

rents from the mountains, before it; which the army of ſuccours cannot paſs without falling into diſorder.

It is eaſy raiſing the ſiege of a place when ſurrounded by high mountains juſt within the reach of cannon ſhot, and which oblige the beſiegers to carry their circumvallation a great way farther off; or when ſituated in ſuch a manner as not to admit of that line being carried on upon the higheſt eminencies, by which means the army of ſuccours may always command the beſieger's lines; but when this circumſtance is to be met with in ſo high a degree as at *Flich*, a town of *Catalonia* ſituate upon the *Eber*, ſuch places become almoſt impregnable: That river forms a very ſtrait Peninſula, where the Fortification ſtands, which afterwards extends itſelf by ſmall degrees till it forms a cape of a ſmall *French* league in circumference, bounded on its extremity by pretty high mountains, but which are commanded by others ſtill higher than themſelves, which laſt are almoſt all entirely rock; juſt oppoſite to the fortification the mountains fall off from the river in ſuch a manner as to make it abſolutely impracticable the carrying a line of circumvallation along their ſummits, both in regard to the vaſtneſs of the extent, making at leaſt five or ſix *French* leagues in circumference, as becauſe it would be perpetually commanded all around, and that almoſt the whole muſt be made of earth carried thither for that purpoſe. The ſiege of a place like this

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ought never to be reſolved on, unleſs you happen to find it entirely unprovided, and may expect to carry the place in a few days, or are yourſelf ſo abſolutely maſter of the field, as to be aſſured no army can poſſibly come to it's relief in ſix months time. In general, Places ſituate on mountains are eaſily to be ſuccour'd, when round the camp of the beſiegers there are commandments on commandments, in ſuch a manner, as to render the carrying on the line there a work of infinite labour, and requiring a proportionable number of troops to defend it.

On the other hand, the difficulty is next to an impoſſibility of raiſing the ſiege of a place ſituate in the mountains, when in order to march to attack the Beſiegers in their Camp, you muſt unavoidably paſs through narrow defiles, over skirts of mountains, and through vallies, which the beſiegers may guard with ſmall numbers, and defend with great advantage. Such is the ſituation of the environs of *Nice* on the ſide next *Piedmont*.

* 'Tis eaſy raiſing the ſiege of a place, when 'there is a meeting of ſeveral great rivers near 'it, by which means the aſſailant's quarters be-'come widely ſeparated, and their communica-'tion with each other very difficult; more eſ-'pecially if thoſe rivers are ſubject to great floods, 'ſuch as may carry away their bridges, or the 'ground marſhy all along their camp. The ſituation

* *Attaque des places, par le Chevalier de la Valliere.*

tuation of *Strasburg* is very much of this kind, for which reaſon to form properly the ſiege of that great city, the beſieging army ought to be at leaſt double the army of ſuccours.

On the contrary, it is difficult raiſing the ſiege of a place, when the beſiegers camp is covered by great rivers, brooks not fordable, or whoſe banks are very ſteep on either ſide. The ſituation of the environs of *St. Omers* on the ſide next *Artois* is of this kind.

'Tis eaſy raiſing the ſiege of a place when covered with moraſſes or inundations of a large extent, ſuch as oblige the beſiegers to form a conſiderable circumvallation, and to have troops in proportion to defend it.

'Tis difficult to raiſe the ſiege of a place, where the beſiegers have before their camp moraſſes of a great extent, or large canals, woods and defiles where it would be impoſſible for an army of ſuccours to paſs and force their way, becauſe of the ſmall numbers required to oppoſe them.

'Tis alſo difficult to raiſe the ſiege of a place, when the beſiegers, by damming a river, can fill the ditches of their line with water, and form an inundation in its front. According to *Boxhorvius* who has given us an account of the laſt ſiege of *Breda*, it was this circumſtance which chiefly contributed to the ſucceſs of that ſiege, becauſe the dyke being enlarged, and the moraſs ſtopt up, the waters overflowing not only fill'd all the ditches round about

the

the camp, but overſpread many parts of the country.

2*dly*, The neceſſity is not greater of a place's being in a capacity of receiving ſuccours, than that of their garriſons being at liberty to ſally upon occaſion, either in part or the whole, with foot or horſe; without which a place can be of no farther conſequence than in regard to its ſelf only. A ſmall number may block it up; the enemy can at any time prevent the garriſon making incurſions, or pillaging his country, but may himſelf go and ravage the environs with impunity as often as he pleaſes. He can prevent thoſe in the place ſending any convoy or ſuccours of any kind, either to the army or to other places. And in time of ſiege, they can neither ſally to obſtruct the enemy's works, nor to favour thoſe who come to their relief. And whether the enemy chooſes to approach the place, or to leave it on either ſide, or behind him, be the garriſon ever ſo ſtrong, he can with great eaſe to himſelf prevent their giving his army the leaſt diſturbance.

'Tis eaſy for the garriſon of a place to ſally when ſituate in the midſt of a large plain, or upon an eminence of eaſy deſcent, with a level country all around. Theſe two are the moſt favourable ſituations for the garriſon's ſallying upon any occaſion.

Places ſituate on an Iſland in the midſt of the ſea, or on a Lake, afford this convenience to their garriſons, provided they have good

Ports,

Ports, from whence to make excurſions upon the ſea with armed veſſels, to interrupt the navigation of their enemies, or prevent their entrance of the neighbouring rivers, and by theſe means to tranſport their own garriſons where they think proper. Such places, however, are better ſituated for their own defence than for the attack of others.

Places ſituate on the Sea-ſhore, and likewiſe thoſe on a Peninſula, have this advantage two ways. Firſt, by land, if the country is an even plain, or if ſituate upon eminence, with a gentle eaſy decline, and a flat country at the foot of it; Secondly, by Sea, if they have ſecure harbours. In general, all ſituations which eaſily admit of ſuccours, have the ſame eaſe and convenience for their garriſon's ſallying.

3dly, 'Tis a great advantage to a place, when the army of the beſiegers muſt be hard put to it to furniſh themſelves with neceſſaries for carrying on their works, and for their own ſubſiſtance during the ſiege. This difficulty may ariſe five ſeveral ways.

Firſt, When the enemy has no place for fixing his Magazins, nor any large enough to hold all the ſtores neceſſary to form a ſiege. *Frederickſtadt* and *Frederickſhall* on the Frontiers of *Norway*, had this advantage. When *Charles* XII. King of *Sweden* wanted to attack the latter in the year 1708, he was obliged, in the firſt place, to fortify *Stromſtat*, as well as its ſituation would permit, to eſtabliſh his maga-

zins

ziris there. *Salluſt* ranks *Capſa* and *Thala* towns of *Numidia* in the liſt of exceeding ſtrong places, becauſe ſtanding in the midſt of deſerts.

2*dly*, When an enemy would find it very difficult to bring up his convoys, either through the badneſs of the roads, or the long way they have to come. This is a difficulty which attends all the places the *French* King has amongſt the *Alps*. It would be found at *Sedan* likewiſe, for the enemy not being maſters of the *Meuſe*, would be obliged to bring their convoys by land a-croſs the forreſt of *Arden*, a country all of wood and mountains, and where the roads are in many places impaſſable. On the other hand, Places ſituate on the Sea-ſhore, or on a Lake, River or Canal, of which the beſiegers are maſters, are extremely convenient for tranſporting thither all the neceſſaries for a ſiege, or for the ſubſiſtance of an army.

3*dly*, When no forrage is to be had in the environs of the place. Several of thoſe amongſt the *Alps* and *Pyrennees* have this advantage.

4*thly*, When there is no wood to be got, either for dreſſing the army's proviſions, or conſtructing their works. If at *Malta* the precaution had been taken of cutting down all the wood there, and carrying it into the place, the beſiegers could not have continued long before it, unleſs they had taken meaſures beforehand for ſupplying themſelves elſewhere. On the other hand,

hand, 'tis a great defect in a ſituation to have forreſts very near it, and for the country round about to afford great plenty of forrage. Theſe two diſadvantages in a ſituation, have ſometimes induced Generals to beſiege places they would not otherwiſe have undertaken; which was the caſe of *Breda*, according to *Hermanus Hugo*.

5*thly*, When there is not to be found in the neighbourhood a ſufficient quantity of water for the uſe of the army. *Philipville*, betwixt the *Sambre* and the *Meuſe* is ſaid to have this advantage. The year 1559, *Henry* II. could not beſiege *Bapaulm* *, becauſe there was no water thereabouts, the inhabitants having ſtopt up and covered all the wells in the country. The ſupplement of *Ceſar*'s Commentary likewiſe furniſhes us with an example of this kind. From thence, ſays *Hirtius* ‡, we drew off towards *Oſſona*, a town ſtrong both by nature and art, having this advantage beſides, that there is no water to be had within two leagues of its environs; ſo that it ſeems to bid defiance to an enemy. Young *Pompey*, likewiſe, who had ſhut himſelf up in it, had cut down all the timber for a league and a half round, and taken it into the place, ſo that we were forced to go to *Munda* to look for timber for our machines.

* *Mezeray.* ‡ *Hirtius de Bello de Hiſpan.*

SECTION

SECTION VI.

Of the ſixth Condition.

THE ſixth condition, is for the ſituation and its environs to be capable of furniſhing the neceſſary materials for the conſtruction of the fortreſs; that thoſe materials be of a good kind, and have an eaſy manner of conveyance.

Where there is neither good earth, good ſand, nor good ſtone, wood, nor other materials, but all thoſe things muſt be had elſewhere, and brought from far with much labour and expence, the fortifying ſuch a place ought not to be undertaken. The principal materials neceſſary being Earth, Free-ſtone, Bricks, Stone of a browner ſort, Lime, Sand, *&c.*

The neceſſary quantity of theſe depends upon the bigneſs of the place, and on the breadth and heigth of the works which are to compoſe it. Earth is the moſt eſſential and neceſſary material, in regard to the large quantity required, then Free-ſtone, Brick, brown Stone, Lime and Sand, if it is intended the works ſhould have a revetment.

In ſituations on a high plain, whether of a continued or broken ſurface, there is generally to be found a ſufficient quantity of good earth for making the works, and even more than

than is wanted. It were rather to be wiſhed, that no more were to be met with than the exact quantity only, that the beſiegers might not equally partake of that advantage; good earth ſo much facilitating the making their lines of circum- and contravallation, as well as their approaches.

Situations on a low even plain, where in winter there is always a foot or two of water, and in Summer-time, by digging only a foot and half downwards, it follows the ſpade in great abundance, are preferable to the former; for tho' the conſtruction of the works is exceeding painful and laborious, yet, on the other hand, it occaſions the beſiegers ſo much trouble and difficulty in making their trenches, batteries, and other works, as is enough to diſhearten them to a degree of deſpair: for which reaſon, far from avoiding ſuch ſituations, they ought to be ſearched after, and fortified with abundance of care.

Situations on a flinty ſoil, having only two or three foot of earth above, make it exceeding troubleſome deep'ning the ditches; however as they are no leſs ſo to the beſiegers in carrying on their approaches, batteries, the deſcent of the ditches, and in working their mines to make breach, which diſcourages and fatigues them exceſſively, they are not to be rejected if they have the other conditions; eſpecially if there is an eaſy poſſibility of carrying off all the ſoil that is to be found within

within a certain diſtance of the place, and making the Ramparts, Cavaliers, and other works with it; by which means likewiſe the enemy will be deprived of it.

Situations on a ſoft rock, where the ſtone neceſſary for the conſtruction of the works and buildings of the place, is to be taken out of the ditches, are likewiſe good. If they occaſion leſs difficulty in the attack than the foregoing, they themſelves are as little troubleſome in the conſtruction, or rather not at all ſo. 'Tis thus the town of *Malta* is ſituated.

Mountainous ſituations have ſometimes the neceſſary quantity of earth, and ſometimes want it, as we have already ſaid of plains; but generally ſpeaking, thoſe on high rocky ſituations fall ſhort in this reſpect: When that is the caſe, they cannot be well fortified, unleſs it is determined to have earth brought from the neareſt place where it is to be found, which cannot be done, but at a very great expence; on the other hand, the inconvenience is no leſs to the beſiegers, who will have none to cover them in their approaches.

Aquatick ſituations have ſometimes a ſufficient quantity of earth for their fortifications, and ſometimes not, according as the earth or water prevails; only moraſſy ſituations almoſt always want it. But if the conſtruction of their works becomes a matter of difficulty by this means, the carrying on the approaches as was ſaid before, is no leſs ſo to the beſiegers.

The beſt marſhy ſituations in this reſpect, are ſuch as are on a riſing ground in the midſt of the marſh, and of an extent juſt ſufficient for receiving the intended Fortreſs.

Good materials are abſolutely neceſſary to make a good fortification, more eſpecially in regard to earth and lime, of which the mortar is compos'd.

There are infinite kinds of earth, as fat, ſtiff, claiey, marſhy, muddy, ſpuey, ſlimy, ſandy, gravelly, ſtony; of which laſt, likewiſe, there are ſeveral kinds, as that mixt with ſmall ſtones or great, with ſoft, hard, or indifferent, flinty, *&c.*

For brevity's ſake, we ſhall here ſpeak only of the four principal ordinary kinds, to wit, the ſtony, ſandy, marſhy, and the fat ſtiff ſoil.

The worſt of theſe is the ſtony, becauſe it neither binds nor ſupports itſelf, and when parapets are made of it, the ſhot entering within, makes ſad havock, and the ſtones flying about on all ſides, do more execution than the bullet. 'Tis neither proper for making parapets, nor rais'd works of any kind, unleſs they are lined with walls throughout, for otherwiſe they cannot ſupport themſelves.

There is, however, one advantage attending ſuch a ſoil, and that is, it puts the beſiegers to difficulties to cover themſelves in their approaches, who find themſelves exceedingly incommoded by the ſtones beat out of their works

by

by the cannon of the beſieged. When one is obliged to make fortifications on a ſoil of this kind, the earth for the parapets muſt be ſifted, or the beſt veins of it pick'd out for that purpoſe, or good fetch'd from ſome other place.

A ſandy ſoil is as bad, having no contexture, and being perpetually ready to fall in: When the wall that ſupports it is once broken, it drills away, and runs off like water, for which reaſon ſome Naturaliſts have ranked it in the liſt of fluids. There is no making a good work with it, any more than the former, without giving it a revetment either of brick or ſtone. When one is under a neceſſity of uſing it, it muſt be mixt up with good earth if poſſible, and the ſurfaces covered every where with broad turf, to prevent the wind's blowing it away; if this ſandy ſoil gives a good deal of trouble, in the conſtruction of the works, in forming the ramparts, enlarging and deep'ning the ditches, in making the cover'd way, and raiſing cavaliers, it puts the beſiegers under no leſs difficulty, when the place comes to be attack'd, to make their trenches, to form and raiſe their batteries, but above all, in making their deſcent of the ditch, if it is a dry one and deep. 'Tis on this account, that when neceſſity conſtrains us to make uſe of it, ſuch a ſituation is not to be rejected; but when that is not the caſe, it ſhould be let alone, if only for this reaſon,

that when the wind is high, it blows that ſandy ſurface about on all ſides, ruffling it like the waves of the ſea, filling up the ditches, and raiſing hillocks upon the glacis, and beyond it almoſt as high as the parapets of the place, to the great facilitating the approaches.

'Twas owing to this defect in the ſoil, that the *French* army took *Dunkirk* in ſo ſhort a time.

The marſhy ſoil is better than the two former, tho' itſelf is not good in general; becauſe being raiſed into a rampart or parapet, when it comes to be dry, it cleaves, and there is likewiſe always a neceſſity of driving piles in the foundation. When one is obliged to fortify ſuch places, it ſhould be done in the heats of ſummer, that the earth may have more conſiſtence.

That ſoil which we call fat or ſtrong, is the beſt of any kind for works of fortification, becauſe it is tractable, and binds and ſupports itſelf. If the ſituation is low enough to have the ditches fill'd with water, there is no occaſion for giving the ramparts a revetment, unleſs one chooſes it; and if they are to have a revetment, there is no neceſſity for driving piles in the foundation, nor ſo much as to make a drain. In earth of this kind, the cannon has very little effect, the ſhot not penetrating above 10 or 12 feet, and leaving only the mark of it's own entrance, buries itſelf, without any ſhock given the work. It's fault is, that it is extremely commodious for making mines.

The

The materials of which the maſonry is compoſed are ſtones, brick, lime, and ſand. There are many ſorts of ſtone as well as of earth. As to the ſize of them, they are great, ſmall, or middling.

By great ſtones we mean ſuch as muſt be cut in order to be removed; by middling ones, ſuch as are portable by a few or more hands; and by ſmall ones, thoſe of which a number may be carried by a ſingle hand. The middling and the ſmall ones are thoſe which give leaſt trouble in the working.

As to the place where they are to be found, ſome are ſcatter'd ſingly upon the ſurface of the earth, others taken out of it's entrails, and cut with chiſſels by the quarry-men. The firſt are of no uſe to build with, becauſe having laid for a long time expoſed to the ſun, and the injuries of the weather on all ſides, their radical moiſture muſt be conſumed, for which reaſon they will not bind with mortar, nor make any work of long duration.

As to their particular qualities, they are either ſoft, hard, indifferent hard, rock, flint, marble, brown free-ſtone, *&c.*

The ſofter kind have the advantage of being eaſily cut and manufactured for the work. Such are thoſe white ſtones found in *Champagne*, and in ſome parts of *Picardy*, *Artois*, and *Hainault*; if they are made uſe of where they are under cover, as for the inſide of the wall which ſurrounds the fortreſs, they will

be ſerviceable, and laſt for a long time; but if uſed for the outſide, the froſt and the rains waſh them away, and crumble them to duſt; and when uſed in buildings near the ſea-ſide, the ſalt air corrodes, and the very heat deſtroys them.

The moderately hard ones will ſtand the froſt, becauſe they have fewer moiſt and earthy particles, and more of air and fire in them than the ſoft ones.

Hard ſtones are ſuch as will not moulder away by the ſeverity of the froſt, and are therefore of long duration; they are more capable of reſiſting the froſt, as they have but little air or fire in their ſubſtance, but abound in moiſt and earthy particles, qualities proper to conſolidate them to a degree beyond the power of the froſt to injure them.

The word rock has various ſignifications; ſometimes it is taken for that hard and quick ſtone found lying in great long beds in the bowels of the earth, which ſerves to ſtrengthen that elementary body in the ſame manner as bones the animal ones. Thus *Ovid.*

——lapides in viſcera terrae
Oſſa reor dici.

By rock we here mean an extreme hard quick ſtone, very difficult to cut with the chiſſel; for which reaſon 'tis of no uſe for works of this kind.

Flint

Flint is á ſmall and very hard kind of ſtone, which ſtruck by iron or ſteel, throws out ſparks of fire. This ſtone as it will neither cut well, nor bind with mortar, ſhould never be made uſe of for the works, but in their foundations only.

* *Pliny* writes, that in ſome rocks were found natural flints exceſſively hard, yet capable of being cut into any form at pleaſure, and that the *Greeks* made uſe of them in their buildings, in the ſame manner as bricks were uſed in other places.

Marble is a kind of ſtone extremely hard, ſolid and difficult to cut. About *Namur* and *Charlemont* is found ſome pretty ſoft, they make uſe of it in their buildings, and even in the works of the place.

Grais, or brown free-ſtone, is a kind form'd of ſeveral grains of ſand glued together, by means of ſome earthy particles ſticking in the pores betwixt them. There are of different degrees of hardneſs.

In ſome places it is uſed to form the ſalliant angles of that wall which ſurrounds the fortification, and is extremely good for that part of its ſurface which is under water.

Brick is a kind of ſtone made of earth baked in an oven. Walls made of it are better than thoſe of ſtone, becauſe when once the latter have received a ſhock from the cannon, and any one part is beaten down, upon the leaſt

* Nat. Hiſt. Book 36. chap. 11.

firing afterwards, the reſt all tumbles down after it. This never happens to walls made of brick, when the mortar is good; 'tis all but one body, and the bullet only makes its hole, as is found by daily experience. The goodneſs of the brick depends upon the quality of the earth. White clay is the beſt for the purpoſe; that which is gravelly, flinty, or ſandy, is good for nothing.

To have a right notion of the nature and property of ſand, it muſt be obſerved, that the elementary earth is compoſed of three ſeveral ſubſtances: of mud, which is the lighteſt and moſt fruitful part; of clay, which is of a gluey nature; and ſand, which is the dryeſt and heavieſt part. By means of theſe two properties, ſand gives it ſolidity, and contexture, and ſerves as a baſis to the whole, in the ſame manner as it does in mortar. Sand and gravel differ no more, than that gravel is a coarſer kind of ſand mixt with ſmall flint ſtones.

Sand is to be found not only in the ſea, and in rivers, but likewiſe in the earth. That which *Vitruvius* calls pit ſand is the beſt of any kind for building. According to that Author, there are four ſorts of it; the black, the grey, the red, and the carbuncle or flame-coloured. The worſt quality ſand can have, is to be earthy. 'The beſt in general, is that, ſays *Vi-*
'*truvius*, which, in rubbing betwixt the palms
'of the hands, make a grating noiſe, which
'the earthy ſort never does, becauſe it has no
'harſhneſs.

'harſhneſs. Another mark of good ſand is, when 'thrown upon a white ſtuff and ſhook off a-'gain, it leaves no ſoil behind it. If no pit 'ſand is to be got, the beſt of the gravelly 'kind muſt be ſifted out, or, upon occaſion, ſea 'ſand made uſe of. But the latter has this fault, 'that the mortar made of it is long a drying, 'and ſuch walls as are built with it, will not 'bear any great load, if not built at ſeveral 'times; but manage it how you will, it will 'never do for the plaiſtering of ceilings. It has 'likewiſe this bad quality, that thoſe walls 'which are rough caſt with it, ſweat perpetually 'from the diſſolution of the ſalt, which ſets the 'whole a running. But mortar made of pit 'ſand dries preſently, and walls rough caſt, or 'ceilings plaiſtered with it, will laſt for a long 'time, eſpecially if uſed as ſoon as taken out 'of the ground. Some builders ſay, that river 'ſand is good for nothing, if what is upper-'moſt of it is not raked off, and that earthy 'matter taken away, which clods all together, 'and makes a cruſt upon the ſurface. And 'that gravel, on the other hand, has no part 'good but the top; becauſe what is under-'neath is too coarſe. They likewiſe adviſe 'the waſhing the ſea ſand in freſh water be-'fore it is uſed.

Lime which is the leaſt ingredient in build-ing, but the moſt proper for binding and ſtrengthening it, is the work of man's induſtry, and not the entire gift of nature, like ſand.

To

To be good, according to *Vitruvius*, 'it ſhould 'be made either of white ſtones or flints *; it 'is to be obſerved likewiſe, that what is made 'of the ſmootheſt and hardeſt ſtones or flints, 'is beſt for maſonry, and that made of ſtones 'a little ſpongy, moſt proper for plaiſter-'work.

'There are certain countries to which nature 'ſeems to have given materials particularly 'proper for building ſome kinds of works. '*Juſtin* tells us,† that *Semiramis* who had built 'the city of *Babylon*, ſurrounded it with a ram-'part of brick-work, cemented with ſand and 'bitumen, which is a kind of pitch that from 'the violent heat there bubbles out of the 'ground in many places.

'There is a kind of powder, ſays *Vitruvius*,‡ 'found in the country of *Baia*, and in the 'ground about *Veſuvius*, to which nature has 'given a wonderful virtue; this powder when 'mixt with lime, knits ſtones together ſo 'ſtrongly as to form a body of an extreme du-'ration, not only in ordinary buildings, but 'even at the bottom of the ſea;' 'tis excellent for building moles, quays of ſea-ports, or of rivers, and either ſuch works as are under cover, or beaten by the waves of the ſea.

The ſame Author ſays, there is another ſort found in *Tuſcany*, which makes the ſand called *Carbunculus*; and both of theſe are admirable

* *Lib.* II. *cap.* 5. † *Lib.* I. ‡ *Lib.* II. *cap.* 6.

for

for the ſolidity of the maſonry compoſed of them, only one is more proper for buildings on the ſhore, the other for works to be made in the ſea.

In *Catalonia*, and more eſpecially about *Barcelona*, is found an earth which alone might ſerve for building the walls of the body of a place; ſuch as would be extremely ſolid, and capable of reſiſting the injuries of time.

We have ſpoken of the principal materials only, and thoſe of which the largeſt quantities are wanted; for as to other things, when they fall ſhort there is not ſo much difficulty in having them brought from far, and there are ſome of them, as Iron and Lead, which are hardly ever to be found on the ſpot.

Eaſe and convenience of carriage are likewiſe much to be deſired in a ſituation, and are to be found when the place, whence the materials are to be had, is near at hand, and the ways level and ſmooth, as is uſual when the ſituations are upon a plain; or if the place is farther off, when they may be brought either by ſea, lake, river, or canals, made or to be made with eaſe and little expence for that purpoſe; but it muſt be remember'd, that the beſiegers will reap a like benefit from that water carriage, to bring them whatever they want for the ſiege, ſuppoſing the water to extend as far as their own country, and to be ſo far navigable.

In ſituations on very high mountains and rocks, the carriage of materials is extremely diffi-

difficult, and sometimes it is not without much trouble that even provision and ammunition are brought thither.

SECTION VII.

Of the seventh Condition.

THE Seventh Condition is, that the country of the environs furnish plenty of necessaries of all kinds for life; as corn, fruits, roots and greens, fewel, forrage for the cattle, horses, *&c.*

Some Politicians have made it a Question, whether the most barren parts of a country ought not rather to be chosen for building towns, where men being constrain'd to get their living by their industry, would be in no danger of falling into slothfulness, would have more strength and valour for their own defence, and live with greater union amongst themselves; the poverty of a country not being the natural source of divisions amongst its inhabitants.

Thucydides seems to have been of this sentiment; he says in his first book, that the best parts of *Greece* were most subject to revolutions, as *Thessaly* and *Beotia*, with the greatest part of *Peloponesus*, *Arcadia* excepted; for that abundance which augmented their strength engender'd divisions, to the ruin of the inhabitants, and gave them up a prey to strangers;

but

but the country of *Athens* had been leaſt ſubject to changes, becauſe being a light ſoil and producing but little, it had neither given occaſion for ſedition nor envy.

To reaſon upon this point, it muſt firſt be reſolv'd whether the city intended to be built, and its dependancies is to form a State itſelf, or only to make a part of another's Frontier.

If that City alone is to form an entire State, we are of the ſame ſentiment with *Machiavel*, who is for avoiding barren places on theſe occaſions,* 'the chooſing which, ſays that Politi-
'cian, would be undoubtedly the moſt pru-
'dent and moſt uſeful meaſure, if mankind was
'naturally inclined to be content with what
'they poſſeſs'd, and had no ambition of bring-
'ing their neighbours under their ſubjection;
'but that defect of human kind has brought
'things to this paſs, that we are no longer ſafe
'than while we are powerful, and in order to
'become ſuch, barren ſpots muſt be avoided,
'and the moſt fruitful ones choſen for ſuch ſet-
'tlements; where only ſo much induſtry may
'be required as is neceſſary to exerciſe and im-
'prove our ſtrength, to put ourſelves in a con-
'dition of defence againſt any who ſhould at-
'tack us, and to humble thoſe who would
'oppoſe our aggrandiſement. As to ſlothful-
'neſs, of which abundance is the parent, it muſt
'be remedied by laws, when it is not the na-

* *Polit. Diſc.* book I. chap. 1.

tural

'tural vice of the climate; and the conduct of 'thoſe wiſe men imitated, who inhabited a 'moſt pleaſant country, and one too apt to 'produce a lazy race of people, ill diſpoſed to 'the exerciſe either of valour or of virtue; 'Thoſe Sages being deſirous to remedy the diſ-'orders which the beauty of the country had 'produced, doubtleſsly through the means of 'idleneſs, laid an inviolable injunction on all 'perſons capable of it, to train and exerciſe 'themſelves in the art of war, by means of 'which laws ſo wiſely eſtabliſh'd, they became 'a more warlike people than even the natives 'of wild and barren countries.'

If the city to be built is intended only to make a part of the frontier of a State, 'tis equally for its advantage, that it be placed in a fertile country; the rather as at this time of day, it is not the town inhabitants who are to guard and defend it, ſo that no inconvenience can ariſe from their luxury, in this reſpect. That fertility not only engages their own reſidence, but draws a number of ſtrangers thither, by which means it becomes in a ſhort time populous and wealthy, and enabled to pay the taxes impoſed by the Sovereign for the repair and maintenance of the works and garriſon. When threaten'd with a ſiege the Prince need be at no charge for tranſporting proviſions thither; and if thoſe of the place have the precaution to withdraw into the town whatever the neighbouring country affords of that

kind,

kind, and either to ſpoil or burn them, the beſiegers will be able to draw no more ſuccours from thence for the ſubſiſtance of their army, than if the town were ſituate in one of the moſt barren countries: For which reaſons we hold with *Machiavel*, that the wiſeſt courſe when it can poſſibly be purſued, is to pitch upon fertile places for the ſituation of all towns whatſoever, provided good laws are made, and good diſcipline kept up, to prevent thoſe diſorders which plenty might introduce: He produces an inſtance from antiquity very apt upon this occaſion.

'*Alexander* the Great, ſays he, being deſirous 'to build a City from a motive of vain-glory, 'an Architect named *Dinocrates* preſented him 'with a plan for building one upon mount *Athos*, 'which beſides the ſtrength of its ſituation had 'this ſingular advantage, that it was capable 'of being built in the form of a man, which 'would be ſomething very curious, ſurpriſing, 'and worthy the greatneſs of its Founder. '*Alexander* ask'd him, how it's inhabitants 'were to be ſubſiſted? the Architect replied, 'indeed he had not thought of that. The Prince 'ſmiled, and dropt his project of the mountain 'to build the City of *Alexandria* in a place 'where the fertility of the country, and the 'convenience of the ſea and *Nile* together 'might invite and detain its inhabitants.

The ſame ſtory is told by *Vitruvius* almoſt in the ſame manner, with this difference only, that he makes *Alexander* ſay, that as a child

could

could neither receive nouriſhment nor growth without the nurſe's milk, ſo the people of a city could not be ſupported, much leſs could they flouriſh and grow great without abundant proviſions. *Lib. 2. præf.*

Situations upon Plains have the moſt frequently this advantage of Abundance and Fertility; it is ſometimes found in the mountainous ones, but rarely amongſt the very high rocky ones, unleſs that maſs of ſtone on which the place ſtands be in the midſt of a plain; ſuch a kind of ſituation as *Juſtin* gives the town of *Dara*, which *Arſaces* King of the *Parthians* built upon the mountain *Zapportenon*; ſuch is the ſituation of that place, ſays the Hiſtorian, as nothing can exceed either for ſtrength or beauty: The mountain is ſurrounded on all ſides by rocks ſo ſteep, that it wants neither men nor fortifications to defend it; and the plain all about it ſo fertile, that the riches of its own growth are ſufficient to furniſh the inhabitants with all the neceſſaries of life: Beſides which, there are ſuch a number of woods and ſprings as give a verdure to the whole country, and embelliſh it with retreats for the pleaſures of the chace.

Tho' iſland-ſituations, or thoſe on the ſea-ſhore, or upon large lakes, rivers and canals, have not this advantage of fertility; yet they want nothing, from the convenience they have of importing from the moſt diſtant places all the neceſſaries of life; and it is owing to this circumſtance rather than to any fertility of their

own,

own, that *Athens* heretofore, and *Venice*, *Genoa*, and many other cities at this day, are become ſo conſiderable.

SECTION VIII.

Of the eighth Condition.

THE eighth condition is, that the ſituation be ſuch as to be fortified at a ſmall expence.

This condition doth not immediately regard the ſituation; 'tis ſometimes to be met with in one place, ſometimes in another, as they happen to be attended with certain circumſtances.

Thoſe who have wrote upon ſituations before me, having taken no notice of this condition, we have thought proper to ſpeak to it, as it happens ſometimes to be that which requires the chief regard.

Situations on a very low plain, where the ditches may be fill'd with water, and the ſoil is good, are of ſmall expence; becauſe there is no neceſſity, unleſs one chooſes it, for giving the works a revetment; which revetment is a conſiderable expence, even in the countries beſt provided with the materials.

Situations upon mountains have no occaſion for high ramparts, nor for very high parapets; but the ſaving in that particular is not conſiderable.

Situations on a ſoft rock, like *Malta*, which furniſhes all the ſtone that is wanted for the works of the fortification, and likewiſe for the buildings, ſave abundance of expence; on the other hand, ſuch as are upon flint or other ſtones of a very hard kind, coſt a great deal in the excavation of their ditches, and if their earth falls ſhort, ſtill more for the carriage of ſuch a quantity as is neceſſary for the parapets.

Situations upon ſteep rocks, inacceſſible on all ſides, cannot require any great expence to fortify them.

Situations ſurrounded with water may be fortified at a ſmall expence, ſuppoſing them to lye very low, and their earth proper for making works; otherwiſe their expence will be very conſiderable: It is likewiſe neceſſary, if they lye in the open ſea, that they be in no danger from high tides, or any extraordinary ſwellings; and if they are in the midſt of a river, that they be ſecure from the effects of the violence or rapidity of its current; otherwiſe, there will be a neceſſity for raiſing dykes and moles, and peer-heads to break the water in both of them, which cannot be made and kept up without a conſiderable expence.

As to ſituations on the ſea ſhore, or on lakes or rivers, thoſe ſides of them next the water are ſometimes fortified with very little expence, and ſometimes coſt more than all the reſt of the incloſure, as may be ſeen in many towns of the *Low Countries*.

In marſhy ſituations, if the ſpot on which the place is to ſtand is a little higher than the moraſs, if there is a ſufficient quantity of earth for the works, and that good in its kind, it may be fortified at a ſmall expence: But if the ſituation is on a level with the moraſs, the earth of a bad kind, as it can ſcarce be otherwiſe, and not in a ſufficient quantity for the conſtruction of the works, the expence muſt be very great; as to make thoſe works good, either the earth muſt be fetch'd from far, or elſe they muſt have a revetment to ſupply their ill conſiſtence; and as that kind of ground is ſeldom good at the bottom, the baſtions will ſink in and go to ruin of themſelves, if their walls are not ſet upon good pile-work, which cannot but amount to an exceeding great expence. 'Tis confidently affirmed, that the foundation of the Town-hall of *Amſterdam*, coſt very near as much as the whole building beſide.

The keeping up the works of ſuch places is a vaſt expence, the ditches muſt be continually cleanſing, and the earth-works continually repairing; for as faſt as you raiſe the ramparts and parapets above they ſink and expand themſelves below, ſo that it is a work without end.

Situations of ſuch a bizarre and ſingular kind, as that of *Luxembourg*, require likewiſe a great expence to be well fortified.

SECTION IX.

When ſeveral Situations offer, which of them ought to be preferr'd.

AMongſt that infinite variety of ſituations in the world, there is not any particular one to be found, which has all thoſe advantageous conditions which we have now been ſpeaking of. Nature has done by them as by mankind, not beſtow'd all her favours upon one and the ſame object; to ſome ſhe has given beauty, to others ſtrength and adroitneſs, to ſome vivacity in abundance, to others good ſenſe, and hath made ſo equal a ſortment of accompliſhments and defects, that upon the niceſt ſcrutiny of her conduct ſhe ſeems to have been impartial in her diſtributions. The ſame thing may be affirm'd of her in regard to ſituations; thoſe which have a good air, commonly want water; thoſe difficult of attack by force, are often as difficult to be ſuccour'd; and thoſe which have good earth for their works, are generally eaſily to be attack'd by force.

How neceſſary ſoever it may be to fortify ſuch ſituations, an Ingineer ought never to accept, much leſs make propoſals for building new Fortreſſes on ſuch as we have already excluded on account of their ill qualifications.

Places

Places of this kind being abſolutely incapable of a good defence.

'Tis true we ſee many ſuch fortified at this day, but it muſt be conſider'd ſuch ſituations were at firſt choſen for their convenience of habitation only, and afterwards becoming frontier towns, neceſſity obliged the inhabitants to fortify them in their own defence Whenever it is propoſed to an Ingineer to fortify a place of this kind, if he is obliged to give his conſent, he ought to do it in ſuch a manner as may manifeſt it to be an act of his obedience only; for it is not till after a place is fortified and perfectly finiſh'd, that you plainly perceive the ill conſequences of its defects; it requiring the skill of an Artiſt and great Connoiſſeur to diſcover them before they are executed: Without ſuch precaution therefore, an Ingineer runs the hazard of having that imputed to a defect in his capacity, which was merely the effect of his compliance with his duty.

An Ingineer ought not only to reject all ſituations having material defects in them, but ſhould endeavour as far as in him lies, that ſuch only may be accepted, whoſe conditions are moſt ſuitable to the preſent ſtate of his Sovereign's affairs.

When a Prince is weak, and his revenue inconſiderable, an Ingineer ſhould make it the firſt object of his care, that the ſituation be difficult of attack by force, and to be fortified and maintain'd at a ſmall expence. I do not here

make it a neceſſary condition, that it ſhould be capable of a very ſmall Fortreſs only, for it is very poſſible a place may be large, difficult of attack by force, and eaſy to defend, yet at the ſame time require but a ſmall expence either for the conſtruction or keeping up of its works; as thoſe which ſtand on ſome riſing ground ſurrounded on all ſides with a moraſs, or on ſome large and level ſpot on the ſummit of a mountain with ſteep rocks on all ſides. Theſe two kinds of ſituat ons, tho' they may be great in their extent, are difficult of attack, eaſy to defend, yet require little expence either for the conſtruction or keeping up of their works, and a very ſmall number to guard and defend them. If nature has afforded none ſuch throughout the Prince's dominions, and that recourſe muſt be had to art, ſome low piece of ground ſhould be choſen for the ſituation of ſuch a Fortreſs, where the ditches may be kept full of water; becauſe places that have dry ditches require ſtrong garriſons for their guard.

If the Prince's revenue is conſiderable, his dominions of a large extent and very populous, the expenſiveneſs of the works and numerous garriſon required, are the points leaſt to be conſider'd by the Ingineer; but he ſhould make it the particular object of his care, that it be capable of ſuſtaining ſo long a ſiege, that the Sovereign may have time to draw his troops together; and above all, that the ſituation be ſuch, as to be eaſily ſuccour'd, that as ſoon as he

he ſhall have aſſembled his forces, he may at once march to raiſe the ſiege.

If a Prince is powerful only in a middling degree, an Ingineer ſhould direct his principal attention towards the conditions moſt ſuitable to the ſtate of his Sovereign's affairs.

If the place to be fortified is intended to bar and defend the entrance of a State, ſuch a ſituation is to be choſen as may abſolutely ſhut up the paſſage, and at the ſame time be difficult of attack by force, and eaſily ſuccour'd.

If it is built with an intention to carry war into an enemy's country, a ſituation ſhould be choſen upon the high roads leading to it, ſuch as is moſt convenient for tranſporting thither, either by waggons, horſes, or barks, the victualling ſtores and ammunition to be laid up in the magazines of the place; but above all, the ſituation ſhould be ſuch, as not to be beſieged without great difficulty; by which we mean, that it may not be in the power of a handful of the enemy to prevent the garriſon from ſallying, or from conducting the neceſſary convoys to their own army. Laſtly, an Ingineer in chooſing the ſituation of a Fortreſs ought to have continually before his eyes the principal end for which it is built, and both the preſent and future ſtate of his Sovereign's affairs.

CHAP. VI.

Of the Extent of Fortreſſes.

IN the three preceding Chapters we have ſpoken of thoſe particular places where the Fortreſſes ought to ſtand, we ſhall now proceed to examine the ſize of them, whether 'tis moſt proper to make them large or ſmall, either of which have their advantages and diſadvantages.

The diſadvantages of great ones are, their requiring a numerous garriſon both for their guard in time of peace, and for their defence in time of war, conſequently a greater quantity of proviſion and ammunition; and as their attacks may be very diſtant from one another, the greater muſt be the fatigue and difficulty in their defences.

Their advantages are, that they are capable of being fortified in a better manner, as their angles being more open, their baſtions may be made ſo much the larger and ſtronger, and partake more of the curtain's defence. When attack'd, they require greater armies to block them up; and conſequently, are themſelves eaſier ſuccour'd than leſſer places; their garriſons are not ſo diſquieted with the ſhells during a ſiege; they can make better ſhift to get proviſions,

ſions, medicines, nay even ſtores of war, and materials for the repairing of their works.

In ſpeaking of the advantages and diſadvantages of large places, we have ſpoken, tho' ſilently, of the ſmaller ones; ſince whatever is advantageous in the one, is diſadvantageous in the other, *& e contra.*

Before we enquire what may be the proper ſize for Fortreſſes, we muſt firſt diſtinguiſh the places where they are intended to be built, and likewiſe thoſe which are to have inhabitants beſides their garriſon, and thoſe which are to have a garriſon only; for where there are few or no inhabitants, they may either be made great or ſmall, as beſt ſuits the Sovereign's affairs, without other conſideration; but where there are towns already, and thoſe full of people, regard muſt likewiſe be had to the preſervation and defence of the Inhabitants; and 'tis on this account that we ſhall divide this Chapter into two Sections.

SECTION I.

Of the ſize proper for new Fortreſſes, where there are to be few or no Inhabitants.

TO determine this point the following particulars are to be conſider'd. The ſituation of the State, the power of the prince who

is

is to build the Fortreſs, and that of the enemy expected to attack it, and if he is capable of bringing a powerful army for that purpoſe, how the Sovereign's intereſt ſtands with foreign and neighbouring States; whether theſe Fortreſſes are built for their own defence, or for the attack of others; whether intended to ſerve as a ſtaple for others, and conſequently deſtinated to purpoſes which require a conſiderable extent of ground, as thoſe for arſenals and magazines of ammunition and victualling-ſtores. What number of inhabitants may be expected, that is to ſay, whether it is likely to increaſe upon being fortified. Whether in time of war it may not be a place of retreat for the Peaſants to retire to with their families, their cattle and effects; and laſtly, the ſeveral conditions of its ſituation: All theſe different circumſtances are to be weigh'd and conſider'd before we can determine the bigneſs of a new Fortreſs. We ſhall now proceed to examine them ſeparately.

Firſt, in regard to the ſituation of the State; if it is of eaſy entrance, affording no obſtacle to an invader; in this caſe it is certain there is a neceſſity the Fortreſſes ſhould be large; for experience has taught us, that the largeſt are capable of moſt reſiſtance, if attack'd: And when they are not ſo, if the enemy ſhould leave them behind him, and advance farther into the country, he ſtill finds himſelf obliged to have regard to them, as they are

are more capable of giving him diſturbance than ſmall ones; they are likewiſe, as we have already ſaid, eaſier to be ſuccour'd than the latter.

If the State is of very difficult entrance, or no otherwiſe acceſſible but through mountain-paſſes, where the leaſt handful of men may ſtop an army, in that caſe ſmall Fortreſſes, but good ones, will beſt anſwer the purpoſe, and the making large ones there would not only be an uſeleſs expence, but might be productive of other inconveniences; for places ſituate amongſt the mountains are generally difficult to ſuccour, and as proviſions are very apt to fall ſhort in the great ones, they might eaſily be taken by famine.

If the Sovereign is weak, the dimenſions of his places muſt be proportion'd to the number of his troops, that he may have enough to guard them in time of peace, and to defend them in time of war, and money enough in his treaſury to pay the ſoldier, and to furniſh the garriſons with the quantity of proviſion and ammunition neceſſary for a good defence; otherwiſe it were better to reduce the number of his Fortreſſes to a ſingle one only, and to make that a large one; becauſe a Prince who is inclinable to attack another, would ſooner undertake it if he ſaw his adverſary's forces diſtributed into ſeveral ſmall places, than if they were collected in one large Fortreſs: For to beſiege a place indifferently ſtrong, indifferent numbers

numbers may ſuffice, but to beſiege a large Fortreſs a very conſiderable body of troops will be required. Beſides when a Prince aſpires to make a conqueſt, other Princes, whether his inferiors or equals, who have reaſon to be jealous of his aggrandiſement, will more readily unite to oppoſe him, if his object be a large town than if it were a ſmall one. When Duke *d'Urbin* was attack'd by *Cæſar Borgia*, no Sovereign would intereſt himſelf in his behalf, becauſe his places were ſo ſmall, as to add but little to his power, whoever ſhould make the acquiſition.

When a Sovereign Enemy is weak, ſmall Fortreſſes are ſufficient to oppoſe him; as they are even againſt a powerful one, who can attack them but with a ſmall number of his forces.

Againſt a Prince exceedingly powerful one ſhould build large Fortreſſes only; 'twas on this account the *Athenians*, when the war with *Xerxes* was over, and they wanted to rebuild their city which had been deſtroy'd, enlarg'd its circumference.

When a Prince weak in himſelf has powerful allies, who are ſo thoroughly in his intereſt that he durſt put his Fortreſs into their hands, and depend on them for the guard and defence of it; in that caſe, he ſhould proportion the ſize of his Fortreſs to the power of thoſe allies: 'Twas for this reaſon that when *Caſal* was fortified heretofore by one of the Dukes of *Mantua*, he gave the place a circumference beyond

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the narrow limits of his own power to maintain, and ſuitable to that of the Kings of *France*, to whoſe protection he intended to commit it.

When a Prince has an ally jealous of his greatneſs, and whom he has as much reaſon to diſtruſt as the common enemy, he ſhould proportion the bigneſs of his Fortreſs to the joint power of both, that he may be able to reap ſome benefit from it, even againſt that ally, in caſe of a rupture with him. This way of reaſoning determin'd the *Athenians* to perſevere in enlarging their city's circumference, notwithſtanding the remonſtrances of their allies the *Lacedemonians*, who gave them to underſtand, that it was ill policy building Fortreſſes and Retreats for their enemies. They were ſenſible the *Lacedemonians* were conſulting their particular intereſt only, without giving themſelves any concern about the intereſt of *Greece* in general, and that they had no leſs reaſon to be jealous of the power of that Republick, than of the power of the Kings of *Perſia*.

When a Fortreſs is intended for the Capital of a State, whether the State conſiſts of that ſingle Fortreſs only, or more, it ought to be a large one, becauſe it is certain the number of its inhabitants will increaſe.

If a Fortreſs is intended to ſhut up and defend the entrance of a State, its bigneſs ſhould be proportion'd to the garriſon which the Sovereign is able to maintain there.

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When a Fortreſs is intended to preſerve a communication, or to ſerve as a ſtaple for other places, if the Sovereign is powerful, it is better that Fortreſs ſhould be a large than a ſmall one.

Fortreſſes ſhould be large when intended for holding arſenals or conſiderable magazines; as in towns ſtanding upon great rivers, or where ſeveral ſmall ones meet and have a communication with canals; and are conveniently ſituate for a ſtaple of ammunition and proviſions for a whole army, as well as for other Fortreſſes.

All maritime places, having good harbours, for whatever purpoſe they are conſtructed, ought to be large ones: to be capable of holding magazines and arſenals furniſh'd with neceſſaries of all kinds for the equipment of a fleet upon occaſion.

All places built for commerce ought likewiſe to be large, becauſe it is certain the number of their inhabitants will encreaſe; it was by theſe means *Dunkirk* grew ſo conſiderable in a ſhort ſpace of time.

If it is intended as a place of retreat for the people of the country, their families, cattle and effects, in time of war, the bigneſs of it ſhould be proportionable to the expected number of thoſe refugees, *&c.* Such is the ſituation of a place built in ſome iſland of a ſmall extent, remote from the continent, and which forming a State of itſelf, cannot expect the neighbouring States (in a caſe of neceſſity) ſhould be willing

willing to receive more of them than is conſiſtent with their own ſecurity. Theſe were the reaſons which induced *Cottonere*, the Grand Maſter of *Malta*, to take ſo large a compaſs of ground into that Fortreſs he undertook to build there during his Regency, and whoſe principal object was the covering the harbour *Le Bourg*, and the Iſle of *Sangle*. That Prince knew there was no depending on the fidelity of men ſhut up in a place beſieg'd, after abandoning their wives and children to the diſcretion of the beſiegers: He knew that the towns and forts together were not capable of containing all the inhabitants of town and country, without embaraſſing the ſoldiery; and foreſaw, that if *Malta* ſhould be threaten'd with an attack, it would be a difficult matter to get all their uſeleſs people tranſported to the neighbouring countries, ſuch a number of bottoms would be wanted for that purpoſe; that *Sicily*, its neareſt neighbour, might be in danger of an attack at the ſame time, and perhaps unwilling to burthen herſelf with the unſerviceable hands of another country, at a time when ſhe rather wanted to get rid of her own; and therefore, as the opportunity now offer'd, it was but prudent to prepare an aſylum for them in caſe of ſuch a neceſſity hereafter. It was partly for theſe reaſons that when the Author was at *Malta* in the year 1715, he was of opinion for compleating that Fortreſs, the rather as the moſt laborious part was already done; that it was evident there would

would not be a ſufficient quantity of ſtuff for the new works propoſed, and that it would be impoſſible to prevent their being overlook'd and commanded in reverſe at a very ſhort diſtance.

All places whatſoever, built to carry war into an enemy's country, ſhould be large and capable of holding all the neceſſary proviſions for the ſubſiſtance of the beſieging army.

The circumſtances of ſituation chiefly to be regarded in determining the greatneſs of a Fortreſs are as follow; Firſt, where the air is unhealthy there ſhould be no thoughts of making a large Fortreſs, becauſe as the numbers of the garriſon muſt be proportionable to its bigneſs, how urgent ſoever the neceſſity, it would be ſacrificing too many people; beſides, no inhabitants would come voluntarily to ſettle there. The caſe is the ſame where the water is not good.

If the ſituation be too much confined to admit of the building ſo large a Fortreſs as the Sovereign intends, a remedy may be found for this defect, provided the Sovereign's purſe will bear it. After building ſuch a Fortreſs as the ſituation will allow of, another muſt be built adjoining to one of its ſides, to ſupply the deficiency of the former, and to which that former may ſerve as a Citadel; this method has been practiſed at mount *Lewis* in *Rouſſillon*: On the other hand, if the ſituation be ſuch as to require a larger Fortreſs to cover it than the Sovereign purpoſes to build, it ought to be conſider'd

which is moſt for his intereſt, whether to conform to the extent of the ſituation, or the narrow ſtate of the Sovereign's affairs.

A Fortreſs ſhould be ſmall, when the ſituation is difficult of attack by force, and eaſy to defend; when it is a hard matter either to throw ſuccours into it, or for the garriſon to ſally, and when an enemy can attack them with advantage.

The Place ſhould be a large one when the ſituation is ſuch that it would be a hard matter for the beſiegers to prevent ſuccours being thrown into it, when the garriſon can ſally with eaſe, and when the beſiegers cannot be ſupplied with all kinds of neceſſaries for their ſubſiſtance during the ſiege.

The convenience of finding the principal materials upon the ſpot, a neighbourhood abounding with proviſions, and where labour is ſo cheap, that works and buildings are of little expence; theſe are ſufficient reaſons for making the Fortreſs a large one.

As the ſtrength and power of a Prince conſiſts in having a number of large and very populous towns, and as the aggrandiſement of his State ought to be one of the chief objects of his attention, 'tis certain he ſhould naturally incline to make all his towns large ones, unleſs he has ſome particular reaſons to the contrary; amongſt which reaſons the fear of wanting inhabitants ought to have no place. Politicians have ſhewn us many ways of peopling towns, for example,

When the Prince is pleaſed to grant them greater privileges and immunities than are granted to others; hence it was that *Rome* made thoſe quick advances towards greatneſs in her infant ſtate, and *Leghorn* to the ſame cauſe owes a great part of her preſent numerous inhabitants.

When the Sovereign encourages the trade of the inhabitants, and eſtabliſhes ſuch manufactures amongſt them as may invite workmen from foreign countries.

When it is the place of reſidence of a great number of the nobility, by whom many of the ordinary ſort ſubſiſt; by this means the town and iſland of *Malta* are become ſo populous, ſince *Charles* V. dedicated them to the ſervice of Religion.

A town grows populous when the Prince there eſtabliſhes the reſidence of ſeveral of his Courts of Juſtice.

When Colleges are founded there, and Academies for the Education of Youth.

Laſtly, When the Sovereign appoints it as a place of Exile for Perſons of Diſtinction on ſome occaſion fallen into diſgrace. The *Venetians* took occaſion by this means, 'tis ſaid, to people *Palma Nova*.

Tho' it be for the intereſt of the Sovereign to have large Cities, the caſe is not the ſame in regard to Citadels; as theſe laſt Fortreſſes are not to be inhabited and guarded but by the military only, who are maintain'd at the Prince's expence, they ought not to be made large but when

when there is a particular neceſſity for it; their magnitude ſhould be determined by the extent of the ſpot they are intended to occupy, by the largeneſs of the towns to which they belong, and the numbers of that garriſon the Prince thinks neceſſary to keep there.

If a Prince cannot afford the expence of building a compleat Citadel, Fort, or Caſtle, and is only able to maintain an exceeding ſmall garriſon, there may be built adjoining to the town walls, and as near as poſſible to the Governour's houſe or Prince's palace, if he reſides there, a ſquare Arſenal incloſed with a ſtrong high wall in the form of a Fort, capable of holding all the artillery and a part of the powder. The wall is built with little expence, and the arſenal may be guarded by a few people; twenty men alone will be ſufficient to guard its entrance, and by keeping a few pieces of cannon and mortars mounted on ſome little eminence within, ready for ſervice againſt the inhabitants if there ſhould be occaſion, the Prince will find himſelf in a capacity of obliging them to return to their duty, if they ſhould ſtray from it; and for his more convenient retreat thither in caſe of neceſſity, a ſubterranean paſſage muſt be made from the palace to the arſenal, for the Prince with his guard and court to enter that way, from thence to defend himſelf againſt the ſeditious; and that he may have it in his power either to quit it upon occaſion, or to receive ſuccours into it, a bridge muſt be laid over the

ditch leading into the country. This method may ſerve very well to protect a Prince from his populace, whoſe revenue cannot bear the expence either of conſtructing, or maintaining the number of troops neceſſary to defend a Citadel, Fort, or Caſtle.

Section II.

When there are large Towns compleatly built and ſtanding on the frontiers, whether it be beſt to fortify them all round, or to leave them quite open, or to fortify them in part only, and to demoliſh the reſt, or leave them to the diſcretion of the enemy.

EACH part of this propoſition has its reaſons *pro* and *con*; when they are fortified compleatly, the inhabitants have the pleaſure of ſeeing the Prince's care for the preſervation both of their perſons and effects, a ſmall number will be ſufficient to garriſon them in peace, and ſhould they be attack'd in time of war they cannot fail making a great reſiſtance: To this it may be objected, that the great number of baſtions required to encompaſs it all round are enough to exhauſt the treaſure of a whole country; if a garriſon is put there, their numbers

bers must be proportionable to the many out-guards and centinels you are oblig'd to keep; if you trust entirely to the inhabitants, and have neither Fort or Citadel, they are as much masters as the Prince himself, and the people being always fond of change, upon the least discontent may rise and expel their Governors. 'There 'is a farther inconvenience, says M. *Rohan*,* in 'fortifying large cities, that it makes them so 'proud, that they will not acknowledge their 'Governors longer than things go well with 'them; and on the least mischance in war, the 'citizens are more inclinable to submit to new 'masters, than to lose their effects;' sometimes likewise their fortifications put it into the inhabitants heads to revolt, and encourages them to attempt it, as *Tacitus* says of *Jerusalem*.

If these great towns are left quite exposed, and no care taken to put them in such a condition as to secure them from being insulted; when war comes, they are less solicitous to keep well with the Sovereign than with the enemy; and if the last gets the better, will stretch their purses farther to contribute towards the charge of the war, than if their own Prince had the advantage.

If a part of them only is fortified, and the rest either demolish'd or abandon'd to the discretion or fury of the enemy, 'tis really a very pityable case; 'tis to ruin or expose to the violence of the soldiers what has cost so much labour

* *Parfaite Capitaine*, chap. 19.

and expence to build; and you can no longer expect thoſe people, whoſe habitations you have either razed or abandon'd, ſhould retain the leaſt affection for their Sovereign.

To determine which of theſe meaſures ſhould be taken, we muſt conſider the power of the Sovereign, the particular ſtrength of the town and its dependance, how long it has been under the ſubjection of that Sovereign, the diſpoſition of the inhabitants, their zeal and loyalty for their Prince, the importance of the place to the State, and the advantages of its ſituation.

Theſe great towns ſhould be fortified entirely when they are of importance to the whole State, when they are advantageouſly ſituated and ſufficiently wealthy to bear the expence of their own fortifications, the keeping up of the works, and maintainance of their garriſons, or if they are not able themſelves when the Sovereign's revenue can afford thoſe expences. When fortified they will be in a capacity of defending their own effects, and conſequently their Prince's perſon, the rather as the enemy will not ſo readily form the reſolution of attacking ſuch a town, as one of an ordinary bigneſs.

When they are only of importance to themſelves, and not to the State in general, they ought likewiſe to be compleatly fortified, if they are advantageouſly ſituated, and rich enough to contribute to all the expences neceſſary for their own ſecurity and preſervation.

If

If beſides the above circumſtances they have not been long under the ſubjection of their Prince, or the inhabitants fickle, inconſtant, and of little attachment to the State, they may likewiſe be entirely fortified, provided a Citadel or Fort is ſufficient to keep them in obedience.

Great towns ought to be left quite open when they are of no importance to the State, are extremely diſadvantageouſly ſituated, or when neither the Sovereign nor themſelves are able to defray the charges of their fortifications and repairs; hence it was that we have ſeen heretofore, and ſee even at this day, ſeveral large towns in the *Low Countries*, without any fortifications, or at leaſt very ſlight ones, as *Bruges*, *Louvain*, *Liege*, &c.

Great towns ought not to be fortified when they have not been long under the juriſdiction of their Sovereign, and require great numbers to garriſon them; where ſuch Citadels as the ſituations would admit of would not be ſufficient to keep them to their duty, or the whole amount to an expence exceeding the revenue either of the town or Sovereign; 'tis on this account that Conquerors, after making themſelves maſters of ſuch places, inſtead of fortifying them have demoliſh'd their fortifications, as even thoſe of ſmaller towns, to take from them when conquer'd all poſſibility of revolting. After *Perſeus* was defeated, the Conſul *Paulus Emilius* caus'd threeſcore and ten cities to be plunder'd and diſmantled. The *Turks* are ſaid

to follow the example of the *Romans* in this particular. In the year 1521 the *French* having driven the *Spaniards* out of the Kingdom of *Navarre*, where they had invaded the ſovereign authority, and the latter having as quickly recover'd it again, by the advice of the Emperor *Charles* V. they diſmantled all the towns and caſtles, *Pampelona*, *Pont de la Reine*, and *Eſtella* excepted, to prevent the Nobles revolting in a country where the common people were well affected to their natural Prince. This is a good way to prevent a rebellion, but it may ſometimes happen to leave both parties a prey to a foreign enemy. *Mezeray* ſays, that 'when the *Romans* firſt conquer'd *Gaul*, they 'could reckon up twelve hundred walled towns, 'of moſt of which they either beat down the 'incloſures, or ſuffered them to fall to ruin; 'but whilſt by keeping them thus diſmantled 'they thought to prevent the people's revolting, they laid the country open to the in'ſults of the Barbarians.

Such great towns as are of no importance but to themſelves only, whoſe inhabitants are of a light and fickle diſpoſition, and have but little zeal either for the Sovereign or State, ought likewiſe to be left open.

Great towns ought to be fortified in part, and the reſt abandon'd when they are of importance to the State in general; when one part of them is very advantageouſly ſituated, and the reſt no leſs diſadvantageouſly. When neither Sove-

reign

reign nor towns are by any means in a capacity of defraying the expence of fortifying them entirely, and maintaining a ſufficient garriſon in them.

Great towns ought to be fortified in part, and the reſt demoliſh'd, when they are of importance to the State in general, when the ſituation of the greater part of them is extremely advantageous, and that of the leſſer not only diſadvantageous but prejudicial to the defence of the part fortified, in caſe of an attack; as when it would be capable but of a very faint reſiſtance itſelf, and the enemy afterwards making his lodgment there, in order to attack the ſtronger part, it might both facilitate his approaches, and furniſh him with materials. The ſuburbs of ſuch a town as would give the beſiegers an advantage like this, ſhould be demoliſh'd before it is beſieg'd: It was for this reaſon the *French* demoliſh'd all the ſuburbs of *Metz*, and many beautiful churches there, the better to enable the city to ſuſtain the ſiege of the Emperor *Charles* V. in the year 1552. The ſame meaſures ought to be taken when the garriſon is but weak, and the numbers loſt in the defence of the ſuburbs might prejudice the defence of the town.

CHAP.

CHAP. VII.

Of the quantity of works a Fortreſs ought to have, their form and ſubſtance.

AS the peace and happineſs of a people, and the ſafety of a State may all depend upon the defence made by a ſingle Fortreſs, it is but prudent perfectly well to conſider not only in what parts they ought to ſtand, what is to be expected from them, their ſituation and proper dimenſions; but likewiſe what quantity of works they ought to have, their figure and ſubſtance; as the rightly diſpoſing of the ſeveral parts of a Fortification perfects a happy ſituation, and corrects a defective one; and 'tis on this diſpoſition that the good or ill defence of a place principally depends. The bravery and ſteadineſs of a garriſon, and the ability of thoſe who command may ſupply ſome certain defects, but there are others againſt which they are of no availment. Ill-fated are thoſe troops and commanders who are ſhut up in ſuch places, as almoſt all mankind judge of the merits of a defence by the ſucceſs, without farther regard to circumſtances. How many bad defences have been imputed to governors and their garriſons, which ought to have been laid to their charge

who

who had the direction of the Fortifications? and what applauſes have garriſons receiv'd for the long ſieges they ſuſtain'd, where the works defended themſelves? It is therefore of the utmoſt importance to a State, and for the honour of its troops, that none be entruſted with the charge of fortifying places but men of good capacity, thorough experience, and great diligence in their profeſſion. The crime of neglect in ſuch a one may poſſibly be of greater prejudice to his country than even his who ſhould come and deliver up the place to the enemy; as the whole infamy of the treaſon would fall upon the head of the traitor, whereas the diſhonour of a haſty ſurrender, tho' occaſion'd by defects in the fortification is in ſome meaſure a ſlur on the valour of the whole nation. 'Tis likewiſe of the utmoſt conſequence that an army keep up its reputation for courage with the enemy, for if once they have a notion that you are faint-hearted, from thence forward all attempts ſeem practicable to them, and that ſingle perſuaſion has frequently crown'd the moſt deſperate actions with ſucceſs; in which reſpect, as well as in regard to the importance of the Place itſelf, one may truly affirm the ill defence of any ſingle one may be the loſs of a whole State.

SECTION

SECTION I.

The ſentiments of Ingineers concerning this ſubject.

INgineers are by no means agreed either as to the quantity of works which ſhould compoſe the front of a fortification, nor as to the manner of laying out the deſign, and ſtill leſs as to the form and ſubſtance of its ſeveral parts.

Some, of whoſe number is the Chevalier *de Ville* and M. *de Vauban*, make but few works in each front, and thoſe very ſimple ones, to ſave expence in the conſtruction, as well as the troops and ammunition neceſſary for their defence.

Others, as *Pagan*, *Blondel*, &c. by the great number of works with which they accompany the fronts of their fortification, and the diſpoſition of their parts ſeem to have no farther conſideration than how to encreaſe the difficulty of attack, and protract the defence of the place, without troubling themſelves either about the expence of their conſtruction, or the men or ammunition neceſſary for their defence; tho', at the ſame time, a long defence is not to be made without great appointments, which require great diſburſements, as thoſe again great wealth and power in the Prince.

M.

M. *Coehorn* is fallen into this dilemma, eſpecially in his third manner of fortifying an octagon.

* Some in tracing the plan of a fortification, begin with the exterior ſide of the Polygon, as that determines at once where the points of the baſtions fall, which is of great advantage when rivers, precipices, commandments, or other irregularities of the ſurface, neither admit of advancing, retiring, or deviating to the right or left with the point of the baſtion, but abſolutely compell the placing it on a certain ſpot; † others begin with tracing the interior ſide of the polygon, in order to fix the line of the curtain, which is convenient when the boundaries of the town are already determined by the buildings, or by ſome old rampart, which may ſerve again for that purpoſe.

Some Ingineers of old were for truſting the defence of the place chiefly to the great guns, as theſe admitting of the greateſt diſtance betwixt the ſeveral parts of the fortifications, conſiderably leſſen the expence, as the works may be made ſo much the larger, and Tenailles carried along before the curtains to hold muſqueteers; as cannon-ſhot entirely demoliſh any bridge, lodgment, or other works, the beſiegers find neceſſary to make in the ditch; as no armour is proof againſt them, as againſt other weapons, and when the enemy want to make a lodgment, it is a work of greater difficulty,

* *Pagan, Blondel, Vauban,* &c. † *de Ville.*

difficulty, and longer time to cover themſelves from them than from the musket.

The moderns are for depending chiefly upon the musket for the defence of the place, and would not have the lines of defence exceed its ſhot; becauſe with that weapon may be made a continual fire with little expence, and when a muſqueteer happens to be killed, another inſtantly takes his place; that even the cannon better anſwers its purpoſe at that diſtance, than if the line of defence was longer: That the parts within defence of the musket, are alſo within the defence of the cannon, which advantage is not reciprocal. That this way the uſe of both weapons is preſerved, whereas in the other, the musket, the better of the two, is quite loſt. That to extend the works to the diſtance of cannon ſhot, is to depend on a warlike engine of great force 'tis true, but ſuch as is eaſily overthrown by the enemies batteries, and for execution nothing ſo ready as the musket. That the defence of great guns has this farther inconvenience, that every ſhot conſumes abundance of powder, and its effects are very uncertain. That to fire plunging ſhot, the metal can only be rais'd to ſuch a degree, when that is exceeded the piece wrecks the carriage. That to make proper uſe of this machine, a well laid platform is required, and a carriage well fitted and proportioned; that if either happeneth to be deſtroyed by the enemy, the firing from that part ceaſeth

ceaſeth till another can be brought into its place, which takes up a conſiderable time. That every ſingle piece is a long time in ſerving, by which means it cannot be fired often; and laſtly, that every man is not capable either of charging or pointing it.

The Chevaliers *de Ville*, *Tenſini*, *Lorini*, and ſeveral others * are for fortifying after ſuch a manner, that the lines of the faces produced, may fall within the curtain, and are for making ſecond flanks there as large as poſſible, becauſe they defend the faces by ſhorter lines than the firſt, enlarge the place itſelf, make the firing from the firſt flanks more eaſy, and from thence you can ſee the reverſe of the breach in the oppoſite baſtion, by which means the lodgment becomes a work of more difficulty to the enemy, the paſſage of the ditch is better defended, as it is ſeen from a greater extent of rampart from the place; and by the unavoidable contraction of the ſhoulder of the baſtion, almoſt the whole counterſcarp is defended by the curtain, particularly the deſcent of the ditch

† Other Ingineers again are for having the lines of the faces produced, terminate at the rentring angle ‡; they abſolutely diſapprove ſecond flanks, becauſe in Polygons of few ſides, the angles of the baſtions become too acute thereby, and they defend the faces too ob-

* *A lignes fichantes.* † *Pagan. Blondel, Vauban, &c.* ‡ *A lignes raſantes.*

liquely

liquely; beſides which inconvenience the rentring angle of the counterſcarp obſtructs the flank in its view of the oppoſite face, when the ditches are of a reaſonable breadth, or if you would have that flank command the ditch, the ditch muſt not be made every where of an equal breadth, which muſt occaſion an additional expence.

Nor are Ingineers agreed as to the extent of the flank, ſome are for making it as wide as the ditch, others as wide as the ditch and covered way together, to be on an equal footing of ſpace with the enemy, and able to oppoſe them with an equal number of cannon; others, as *Blondel*, in order to exceed them in front, give the flanks a ſtill greater extent.

Errard perceiving how eaſily the flanks were ruin'd by the enemies batteries on the oppoſite counterſcarp, the better to cover them, as he thought, firſt made them perpendicular to the faces of baſtion, others after him obſerving what little room there was in thoſe flanks, that the gorges became too much ſtraightened, the embraſſures too oblique, that the ditch had too little ſhare of the defence, and that it was not ſufficient for the flank to be covered, if at the ſame time you could not from thence diſcover what the enemy were doing in the ditch, very ſoon changed that method, and made the flank perpendicular to the curtain; the better to defend the ditch, that it might be ſeen of the places it flanked only, and not batter'd in a direct line, but only obliquely,

only, and in the mean time defend the curtain, the bridges and the gates. Count *Pagan* who came afterwards, would have the flanks perpendicular to the lines of defence, for the ſhot to graze the faces, to have a better view of the ditch, and to defend it in a more direct line, the rather as it is an indiſputed maxim in fortification, that the parts which flank, ſhould view thoſe which are flank'd in as direct a line as poſſible. *Blondel*, in his new method, makes them form an obtuſe angle with the lines of defence, to defend both the counterſcarp and the ravelin. * Ingineers at preſent would have them the cord of an arc, whoſe centre is either the point or angle of the oppoſite baſtion, or elſe the angle of the ſhoulder, or a point taken in the center of the oppoſite face, which are pretty near the ſame thing.

Some Ingineers are for ſingle flanks only, and thoſe to be right lines, both to leſſen the expence, and becauſe they think them ſufficiently covered from the field by the ravelin; as likewiſe becauſe they overlook a larger extent of ground, and that, diſpoſe of them in what manner you will, the cannon of the beſiegers will always be ſuperior to any you can place there.

That if any of the pieces on thoſe flanks are not to be ſeen from the batteries on the counterſcarp, they may be diſmounted as eaſily by ſhells,

* *Vauban.*

and that a flank's beſt defence is that which is made with its ſmall arms.

As the flank is intended to defend the body of the Place, and is the principal part that defends it, Ingineers in general are agreed, that no means ſhould be neglected which may contribute to its preſervation, and prevent its ruin; and having obſerved that the cannon of ſingle flanks were liable to be batter'd obliquely, and ſenſible of the impoſſibility of obſtructing the enemies works in the ditch without cannon, they would have the flank compoſed of two parts, the one retiring within the angle of the ſhoulder, the other projecting outwards and called the Orillons. The firſt to hold a cannon, the ſecond to cover it, and to prevent its being obliquely batter'd, and likewiſe for holding muſqueteers.

Theſe Ingineers advance the Orillon more or leſs. M. *de Vauban* advances it only five Toiſes, and M. *de Coehorn* twenty-four, before his upper flank, the better to protect it from croſs fires.

'Tis an indiſputable maxim, that every flank ought to have have ſome cannon conceal'd, for which reaſon moſt Ingineers, who divide the flanks into two parts, are for producing the *Contre Briſure*, or inſide of the Orillon, in a direct line with the point of the oppoſite baſtion.

Some

* Some are for making the retired part of the flank a third of the whole, and the Orillon the other two thirds. ‡ Others make it the half, ſome again two thirds, for placing the greater number of cannon there, and *Blondel* is for making it much larger than the reſt, that the cannon concealed there may have a greater angle to fire within the breach; and for this reaſon M. *Coehorn* is ſaid to have allow'd ten Toiſes to the Orillon, and no farther.

‖ Some Ingineers make this retired part of the Orillon a ſtrait line; others again that the maſonry may better reſiſt the preſſure of the Earth, and that part of the flank be capable of holding a greater number of cannon, would have it an arc, whoſe center is the ſummit of an equilateral triangle, and whoſe baſe the cover'd flank.

† Some Ingineers are for having the Epaulment or Orillon itſelf a ſtraight line; others are of opinion, it would be ſo much the eaſier deſtroyed, becauſe of its angles, and give it a circular form, for the fewer of its parts to be batter'd perpendicularly from the ſame battery.

The Orillon of M. *de Coehorn* is a ſtone tower, with a Souterrain, where he makes caſemates for ſix pieces of cannon, to defend the ditch and face of the ſtone retrenchment within the baſtion, otherwiſe called the ditch,

* *De Ville.* ‡ *Pagan.* ‖ *Vauban.* † *Pagan.*

and face of his capital baſtion; which is the name he gives that retrenchment. There are ſeveral other uſeful purpoſes and advantages which he aſcribes to that ſort of Orillon.

Moſt Ingineers who are for Orillons, would have them of maſonry, earth alone not ſufficiently ſupporting them. The Chevalier *Tenſini*, and a few others, are for having them of earth only, that they may not be broken down or deſtroyed, nor the ſtone rubbiſh beat out from thence hurt thoſe in the places beneath them.

Some conſidering the ditch as the moſt important part of the fortification, and conſequently the part which ought principally to be defended, and perſuaded that places are loſt thro' the defects of the flanks only, place three batteries in them, one above the other, in the form of an amphitheatre, in order to be ſuperior in artillery to the beſiegers, and to be able effectually to prevent their placing cannon on the counterſcarp.

* Others again abſolutely diſapprove of theſe three batteries; their reaſons are, that when the pieces on the uppermoſt are fired, the wadd falling into the lower, may ſet the powder there on fire; that the ſmoak riſing from the pieces of the lower batteries obſtructs the ſervice of the upper ones, and that the lower ones ſoon become uſeleſs, by the falling down of the parapets of thoſe above; that in hiſtory there are many inſtances of this kind. That the flanks

* *Pagan, Blondel.*

flanks of the Citadel of *Cambray* were the occaſion of the loſs of that Fortreſs, the year 1595; for that the *Spaniards* having batter'd the wall, and diſmounted its pieces, the falling ruins choak'd up the lower flank in ſuch a manner, that both became uſeleſs. That it is a difficult matter to make uſe of all three at the ſame time, becauſe of the rubbiſh and ſtuff which is continually falling from above; that as ſoon as the ravelin is taken, they become abſolutely uſeleſs, they are ſo commanded from thence. That the walls before each of theſe places are ſo low, the Place itſelf is in danger of being ſurpris'd by Eſcalade, and that ſuch a quantity of rubbiſh falls down from each wall in that amphitheatre, as in a ſiege might form a breach, and give an entrance into the baſtion.

The Chevalier *Tenſini*, who is for this diſpoſition of the flank, anſwers one part of theſe objections, by ſaying, that to avoid inconvenience from the falling fire, 'tis only putting the powder in a ſecure place under cover, and laying a few planks over the pieces when charged. That if you cannot make uſe of all three flanks at the ſame time, you may uſe them one after the other, and the cannon of one battery be left to reſt and cool, while thoſe of another are firing. That if one happens to be diſmounted, you may fire from the reſt till 'tis refitted. That to prevent the miſchief done by the ſtone rubbiſh from the walls, 'tis only making the

parapets of earth, and by making a ditch before the lower, you will ſecure the place from a ſurprize on that ſide, as well as prevent the beſiegers making uſe of the ruins for a breach.

Moſt Ingineers at preſent perſuaded that the cannon of the beſiegers will always have the ſuperiority, what number ſoever are brought to oppoſe them, content themſelves with a ſingle battery in the retir'd flank, and only endeavour to diſpoſe of that piece which is to fire into the breach, in ſuch a manner, as that it may be in no danger of being diſmounted by the cannon of the beſiegers from the counterſcarp.

Some Ingineers again, that the ditch and breach may be defended by a greater number of artillery than the beſiegers ſhells can diſquiet or diſmount, and not to diminiſh the gorges of their baſtions, but to keep room for making cavaliers and entrenchments there, conſtruct ſeveral vaulted batteries one above the other. This method has great inconveniencies attending it; the beſiegers cannon makes great havock amongſt the piers of the vaults, and may poſſibly at laſt ruin thoſe parts to ſuch a degree, as not only to occaſion the falling in of the vault, but of the whole flank above, and render all the batteries uſeleſs; beſides the ſmoak of the cannon is ſo offenſive to thoſe who have the ſerving of the batteries, that they can neither ſee to load nor manage them; which ſmoak hangs ſo long

in

in the Souterrains, notwithſtanding the ſeveral vents and chimneys made to carry it off, as to occaſion a long interval between the diſcharges, by which means it comes to paſs, the fire of the artillery from all thoſe vaults is not more conſiderable, than if there were only the upper open battery.

Nor do all Ingineers give the ſame dimenſions to the demigorge; thoſe who would have the flanks perpendicular to the curtain, make it the ſixth part of the interior ſide of the polygon, as the Chevalier *de Ville*, and ſeveral others. Thoſe who are for having them perpendicular to the lines of defence, would have the demigorge a large one, for placing upper and lower batteries there, and becauſe it affords a ſpacious entrance into the baſtion, gives room for conſtructing cavaliers, and for making magazines and retrenchments, and enlarges the baſtion itſelf.

Some are for having the faces little, becauſe they are the parts moſt expoſed to the enemy, being at the greateſt diſtance from the defences, others are for making them very large; in the mean time all agree, they ought to be leſs than the curtains, except Count *Pagan*, who often makes them equal to them, in order to have great demigorges, and *Blondel* who ſometimes makes them larger for the ſame reaſon.

Some Ingineers are for having the curtain very large, becauſe it is the part beſt de-

fended, and by that means the flanks ſee better the bottom of the ditch before the faces; others have eſtabliſhed a proportion between that and the face, as *Speckle* and *Marolois*; others, without troubling themſelves about that proportion, are ſatisfied provided the curtain be ſomething longer than the face.

Thoſe Ingineers who began building about the time when breaches were made by cannon, amongſt other things would have it laid down as abſolutely neceſſary, that the points of the baſtions contain a right angle, thinking that by having that degree of ſolidity given them, they will be enabled better to withſtand the cannon; the Chevalier *de Ville* who came ſince, and ſome others have been of the ſame opinion.

Others again are not much concerned tho' the flank'd angle be acute, provided it be not to ſuch a degree as for the point to be eaſily broke by the cannon. They approve of them provided they are above 60 degrees, as they furniſh an opportunity of taking a ſecond flank out of the curtain, and of enlarging the more neceſſary parts of the fortification, as the flanks and demigorges, which augment the defence. Beſides, when the angle is acute, the faces can defend one another, when the flanks come to be broken. Ingineers, as *Sardis*, have even maintained, that of two angles of baſtions, where one is an acute, and the other a right angle, to make an equal breach in both, either by

by mine or cannon, the quantity of ruin required for that purpoſe, will be greater in the acute than in the right angle. The queſtion has formerly made a good deal of noiſe, but has fallen to the ground, ſince experience has taught us, that breaches made in the angles of baſtions are attended with inconveniencies not found in thoſe made towards the middle of the faces above the ſhoulders.

The Ingineers who firſt fortified after cannon were in uſe, were for ſmall baſtions, becauſe being the part the enemy muſt needs attack, and through which they muſt paſs to enter the place, the ſmaller the part, the eaſier it was to guard it, and defend the paſſage. But experience has ſince taught us, that thoſe ſmall baſtions were eaſily ruin'd by artillery, that they were incapable of any retrenchment, and that there was not even room for the troops which ſhould defend them.

It has likewiſe been found, that thoſe great baſtions which were made afterwards by ſome Ingineers, required too great numbers to defend them as they ought, and that in furniſhing a large area for retrenchments, they furniſhed the beſiegers with the ſame convenience for their attacks.

Some Ingineers are for full baſtions, becauſe cavaliers may be rais'd in them to command the field, and defend the paſſage of the ditch, which is not practicable when the baſtion is a void one. Beſides, that when the enemy has made a breach in the face of a baſtion, you may diſpute

pute the ground from your retrenchments, which is not practicable in a void baſtion, becauſe the breach commands the ground where the retrenchments ſhould be made, at leaſt the part remaining fit for that purpoſe is exceeding ſmall.

Thoſe of a contrary opinion ſay, that in a void baſtion, you may make powder magazines, or what other buildings may be wanted; that from thence it is eaſier going out to meet the enemy's mines, when there are no countermines; and that when the ditches do not furniſh a ſufficient quantity of earth to fill up the baſtion, you are obliged to go a great way to fetch it, which is a very conſiderable augmentation of the expence; this laſt circumſtance is what uſually determines the making the baſtion full or void.

Some Ingineers, of whom the Chevalier *Tenſini* is one, are perſuaded it would be an advantageous way of fortifying, if the place was only to be ſurrounded with a ſingle rampart, and the baſtions quite independant and detach'd; becauſe when thus diſpoſed of, the loſs of a baſtion doth not entail the loſs of the place after it, as there ſtill remains a ditch for the enemy to paſs, and a rampart to force; they add, that a ſmaller number of troops would ſuffice to garriſon the place in peace, and even to defend it in time of ſiege. M. *Vauban*'s new ſyſtem of tower-baſtions gives great reaſon to believe he was of the ſame ſentiment.

Others

Others again by no means approve of this diſpoſition, and ſay, that when the baſtions are disjoin'd from the place they can never be defended by the curtain, that is to ſay, they can have no ſecond flanks; that a detach'd baſtion is extremely difficult to defend, eſpecially if the ditch be a wet one; and even when it is a dry one, it is a very troubleſome buſineſs, the tranſporting cannon thither, and ſending them in ſuccours, if they happen to be attack'd; and that baſtions of this kind are capable of no greater reſiſtance than a ravelin or a counter-guard.

Pagan and ſome others would have retrenchments made in the baſtions before-hand, in the ſame manner as they ought to be when attack'd; for example, within the great baſtion they would have another little one form'd, with a good ditch and rampart about it, becauſe all works made at leiſure during peace, and which have had time to ſettle, are much better than thoſe made in a hurry, juſt when they are wanted. That when the ditch betwixt the larger and leſſer baſtion is of a reaſonable depth, it gives the beſieged an eaſy opportunity of carrying out mines from thence, and of making ſorties to overthrow the enemy's lodgments. M. *Coehorn*, in his method of fortifying a Royal Hexagon, makes a retrenchment with a revetment in the baſtion, and with a ditch 16 toiſes wide, at the foot of which retrenchment is planted a row of paliſades,

ſides, with barriers to ſecure the retreat of the ſorties. He calls that retrenchment, his capital baſtion.

Others ſay thoſe retrenchments a little embaraſs the baſtion, and obſtruct the paſſing to and from the great rampart; that they are a conſiderable expence, becauſe they muſt be made in all the baſtions alike; and that if the beſiegers are aware of their diſpoſition, they will take more certain meaſures in their attack.

The ramparts of Places, according to ſome Ingineers, ſhould be rais'd very high above the field, as they cover the houſes ſo much better, as thoſe upon the ramparts have a greater command of the environs, ſee farther into the beſieger's works, can eaſier diſturb them in their approaches and batteries, and defend the detach'd and other outworks to better advantage.

To this they add, that when the rampart is very low the leaſt elevation covers the beſiegers.

The greater number of them at preſent are for giving the ramparts but little elevation, becauſe they ſupport themſelves ſo much better; becauſe they are rais'd with leſs trouble and expence, are leſs expos'd to the beſieger's batteries, their ruins leſs choke up the ditch, and by that means leſs facilitate the paſſage of it, and a ſmaller ſpace of ground is left at the foot of them undefended; the ſhot fired from thence graze better, and the ſoldier is not obliged to expoſe himſelf ſo much, to defend the foot of the glacis;

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the cannon doth not wreck its carriage ſo much; and laſtly, in order to make a breach in them, the beſiegers are obliged to bring their cannon to the ditch ſide. *Dogen* was of this ſentiment, and for his reaſon inſtances the town of *Breda*, whoſe too great height of rampart prov'd prejudicial to it, and gave the beſiegers an opportunity of approaching it with ſo little danger, that the beſieged were obliged to defend themſelves by rolling down ſtones; becauſe if they had made uſe of ſmall arms, they muſt have been too much expoſed; and they were obliged to make cuts in the rampart in ſeveral places, to fire upon the enemy. A famous modern Ingineer maintains, that the height of a rampart conſiderably obſtructs the defence of it. The enemy, ſays he, ruins the parapets of the faces of the baſtions in the firſt days of the ſiege, without ſparing thoſe of the flanks; the great ſecret conſiſts in burying the place after ſuch a manner, as for it only to be ſeen from the ditch ſide: The maxim is a very good one, but it neither can nor ought to be put in practice in all kinds of ſituations, as we ſhall ſhow hereafter.

A great many Ingineers are againſt giving the ramparts any revetment, both to ſave the expence, and becauſe a ſhot fired into a turfen parapet only makes its hole, without throwing down, or ſo much as ſhaking the contiguous parts; whereas when fired againſt maſonry, it makes a vaſt ruin, ſhocks all around it, and the

ſhards

ſhards flying out may happen to kill or wound thoſe within the reach of them.

M. *Coehorn* ſays, he doth not think it poſſible to build a wall ſo ſtrong as to withſtand a numerous artillery, but that if it be practicable it muſt be at an immenſe expence; 'tis upon this account that he doth not give a compleat revetment to the firſt ramparts of his baſtions, ravelins, or their lower faces, but only to the orillon, curtain, and faces of the retrenchment in the baſtion and in the ravelin, yet ſtill keeps up the firſt ramparts of the two laſt works ſo high, that the walls of their retrenchments are cover'd from the cannon of the field.

Some on the other hand diſapprove ſuch ramparts as have no revetment; becauſe they require a very conſiderable talus, eſpecially if the earth is of a very bad kind, and the ditch a wet one; becauſe a little matter makes them fall in, and when their paliſades are broke by the bomb batteries, an eaſy aſcent is made; that when the beſiegers are once got up to the berm, they can ſlip away to the right and left, and mount to the aſſault by ſeveral ways at the ſame time; that ſuch ramparts, tho' leſs expenſive than others to raiſe, are much more ſo to keep in repair; and *Blondel* ſays, the body of the place in ſuch Fortreſſes, is of no farther uſe than to procure better terms of capitulation, as ſoon as it is ſpoil'd of its outworks.

M. *Coe-*

M. *Coehorn* would have no berm at all, becauſe it renders the rampart every where acceſſible, and leaves a better footing for the beſiegers; but to prevent the falling ruins of the rampart he gives it a ſufficient talus, and the better to ſupport the earth plants a row of ſtakes in the ditch, ſo cloſe as to touch one another. All the reſt of the Ingineers are for having a berm of a ſufficient width for planting a row of paliſades on, for the beſieged to make lodgments there, and to defend nearer at hand the paſſage of the ditch.

Many to ſave the expence of walls in part, and to keep them out of the view of the beſiegers cannon, would not have the revetment of the rampart rais'd higher than the level of the ground, and the reſt of it to be ſupported by turf only. Others diſapprove thoſe kinds of ramparts, eſpecially where the ditch of the place is a dry one, as they greatly facilitate ſurpriſes by eſcalade, and in time of ſiege, if the lowneſs of the maſonry is its protection in ſome meaſure againſt the enemy's cannon, 'tis not ſo againſt the mine.

Almoſt all Ingineers make the parapet four foot and a half high, with one or more banquets, that the musketeer when he has fired may retire under cover; and make embraſures and merlons, to cover both the cannon, cannoneers, and other perſons appointed to ſerve them. The Chevalier *de Ville*, and ſome others, are for having no banquets, but the parapet only

juſt

just high enough to fire over *en barbette*, for the more easy traversing the piece on either side.

All Ingineers are for having the parapets of soft mold, that there may be no shards or rubbish to hurt those behind. *Blondel* would have them all of masonry, and only six foot thick, with three of earth behind, and disapprove those made of earth only, and three toises thick, because 'that great thickness takes up a great 'part of the terre-plain, throws back the de-'fence, and prevents the seeing or defending any 'part of the ditch before it; by which means 'the enemy make their lodgment there with 'ease, and carry on their trenches by demi-'sap, to the right and left from the breach 'towards the retrenchments, when they are 'lodg'd upon the head of the bastion.' There is no danger from their shards or rubbish, he says, when they are made of masonry, because of the three feet of earth behind; and as for those shot which strike the glacis of the parapet, unless they plunge from a great height they rise and fly over it with a rebound.

Some having found by experience how formidable low defences were, what mischievous effects they were capable of producing, and how hard a matter 'tis to ruin them, have from thence taken occasion to make a fausse-bray or second rampart round about the place, within the great ditch, even with, or at most a foot or two lower than the level of the ground, for placing musqueteers

queteers in, to defend nearer at hand the bottom of the ditch and faces of the baſtions.

Others diſapprove of them, becauſe their terre-plain is liable to be enfiladed from the ſaliant angles, unleſs either traverſes are made in them, or the parapet in that part rais'd very high; becauſe they are plung'd into by the ravelin as ſoon as it is taken; and if the ramparts of the place are of earth, the falling rubbiſh from thence fills up the fauſſe-bray; if they happen to have a revetment, the ſhards may kill or wound thoſe who ſhould defend it.

Some Ingineers, not to be obliged to make the ditch wider than the upper flank, or to give the enemy means and opportunity of placing upon the ditch ſide a greater number of cannon than the beſieged can poſſibly bring in oppoſition to them, to defend the flank intended to be deſtroy'd: and becauſe it is a difficult matter to prevent the fauſſe-bray from being enfiladed, which is before the face of the baſtion, would only have that part of it ſtand, which is before the flank and to be of the ſame length with it. Others, for the above reaſons, are of opinion, that there ſhould be none before the faces, but approve of it before the flanks, and likewiſe before the curtains; this is M. *Vauban*'s opinion, and that of ſeveral other modern Ingineers. They would have it ſever'd from the body of the place by a ditch, that it may not be acceſſary to the facilitating an attack either upon the curtain, or

upon the flanks; that is to ſay, that the rubbiſh of the wall of the body of the place and that of the fauſſe-bray together, may not make a breach of eaſy aſcent: This affords one great convenience, which is, that the ditch behind the fauſſe-bray on the flanks ſerves for a place of arms for the troops to ſally from into the great ditch, when it is a dry one, or as a ſecure retreat for the boats when it is a wet; for which purpoſes theſe ſmall works are of excellent uſe. They are called tenailles to diſtinguiſh them from the former. They have likewiſe this farther advantage, that as by their advanc'd ſituation in the ditch they draw nearer to the points of the oppoſite baſtions, the lines of defence may be extended beyond the reach of muſquet-ſhot, which will ſomething reduce the expences of the fortification. In theſe kinds of fauſſe-brays or tenailles, ſome are for giving them faces, flanks, and curtains; others for their having two faces only, parallel to thoſe of the baſtions; others again in ſome particular caſes make them with two faces, and a ſmall curtain; of which three ſeveral forms the firſt is the worſt, becauſe their flanks are enfiladed by the ravelin. Some Ingineers are for their preſenting a ſaliant angle to the enemy, to ſhorten ſtill more the line of defence, and that thoſe within them may be out of reach of the flying ſhards from the wall of the body of the place. M. *Vauban* ſometimes made uſe of one, ſometimes t'other, occaſionally. M. *Cochorn*,

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in his firſt and third method, gives the curtains of his tenailles a ſalliant angle, to make them more capable of defence, and to give the troops in them more room to move.

Ingineers are likewiſe divided in their ſentiments in regard to cavaliers. Some would have them in every front of the fortification, to command the adjacent parts of the field, and to incommode the beſiegers in their works; Others condemn them, becauſe the higher the cannon is rais'd the more naked it ſtands, and expos'd to battery and ruin from every ſide. Becauſe ſhot pointed downwards have neither that force nor certainty of aim as thoſe pointed upwards from below, and neither of them ſo great an effect as thoſe fired horizontally, whether it be againſt a battalion, or againſt a battery, or any other work of the kind; for beſides that plunging ſhot have leſs force in themſelves, they meet with a longer line of reſiſtance in the ſubſtance of the work. That when the beſieger's batteries ſtand on a low ground, to prevent their cannon being ſeen from the cavaliers after their recoil, there needs only the giving their platforms a greater declination. That thoſe cavaliers are a great expence, and that cannon placed on the ſame ſpot on the level ground would be much more ſerviceable in the defence of the ditch and oppoſite baſtion.

Amongſt thoſe who approve of cavaliers, ſome are for placing them on the ſecond flank near the curtain, in order to diſcover the face of

the oppoſite baſtion, and to defend it. Others would have them in the gorge of the baſtions, or in the midſt of the curtains, that one may be ſufficient for each front, and by that means to ſave expence. Others place them in the baſtions. Theſe Ingineers are as little agreed about the form of them, whether it ſhould be circular, oval, ſquare, oblong ſquare, or a rhomboid; the laſt of which is the moſt generally approved.

Dry and wet ditches have likewiſe each of them their partiſans; thoſe who give the preference to the former do it for the following reaſons. Becauſe from thence is eaſier taken out any quantity of earth that may be wanted to raiſe the works; that, according to *Blondel*, the ditch is the place where the aſſail'd may make the greateſt reſiſtance, where they are moſt under cover, and the aſſailants can only enter in file; That in time of ſiege they may ſally from thence either with horſe or foot; That the cover'd way and detach'd works are by its means better ſuſtain'd and defended; That the paſſage of it is eaſier defended by retrenchments and all other kind of ſtratagems; That in time of ſiege the cattle of the country may be drove in there, for the ſubſiſtance of the garriſon; and the place is more eaſily to be ſuccour'd. On the other hand, where the ditch is full of water, there is no defending the outworks but by paſſing over bridges of communication, ſubject to many inconveni-

encies; firſt, on account of their narrowneſs, which occaſions great confuſion; eſpecially when the beſieged are obliged to retire with precipitation; and it is eaſy for the beſiegers to break them down, and overſet their boats and pontoons; that when things are once come to that paſs, the outworks are no longer to be ſupported; that there have been frequent inſtances at ſieges of detach'd works having been loſt, which might eaſily have been defended, had there been any poſſibility of ſending them ſuccours when they were firſt perceiv'd to be in danger: That in cold countries, when the ditch is frozen the place is liable to be ſurpriſed, and in hot ones the waters of the ditches breed unwholeſome vapours, at leaſt if they are not ſhifted from time to time.

The Chevalier *Tenſini*, who prefers wet ditches to dry ones, makes reply to the greateſt part of theſe objections. He ſays, That if the ditch happens to be frozen, 'tis only every day breaking the ice in the middle of it, for the ſpace of about ten foot wide, and piling up the flakes one upon another on that ſide next the place, which when frozen together will make ſuch a kind of wall as is difficult to paſs; as is practiſed in northern countries: That the cattle may be turn'd into ſuch cover'd ways and works as are not attack'd; but as neither theſe nor the dry ditch can afford ſufficient paſture for them, there is always a neceſſity for magazines: That ſuccours may be receiv'd

into the cover'd way, and ſallies made from thence: That ſallies made by infantry and cavalry in a ditch are merely imaginary exploits, becauſe the enemy never comes there till he has perfectly eſtabliſh'd his lodgment, and made ſeveral openings into it; that in the night-time he ſcatters the ground with * crows feet, and upon the counterſcarp keeps cannon always ready charg'd † *à cartouche*. That when the ditches are full of water the place is better ſecur'd againſt a ſurprize, and in time of ſiege lets eaſily carried by aſſault.

Some Ingineers are for having a little ditch, of about two or three toiſes wide, in the middle of the great dry one; *Blondel* ſays they are of admirable uſe, 'provided they are made 'wide and deep; not ſo near the counter-'ſcarp as for the enemy to fill them up by 'throwing in earth from their ſap, and yet a 'ſufficient ſpace left betwixt them and the body 'of the place, for making retrenchments, tra-'verſes, and ſuch other works as are uſual and 'neceſſary for the defence of the ditch.

* A kind of large tenter-hooks, conſiſting of four ſpikes, each about four inches long, diſpos'd in ſuch a manner as, fall which way it will to have three points downwards, and the fourth preſented upwards; the intent of them is to cripple horſe upon their march.

† A *Roulleau* of a cylindrical form, made either of tin or canvaſs, of the ſame diameter with the bore of the piece, which holds both the cannon-ball, leaden bullets, old nails, and pieces of old iron of all ſorts fit for the purpoſe.

Theſe leſſer ditches are not diſapprov'd by any Ingineers whatſoever, tho' ſome are only for making uſe of them, when neceſſary to receive and carry off the rain water; becauſe they obſtruct in ſome meaſure the retreat of the ſallies made in the ditch, as well as prevent them marching out with any large front to attack the enemy, which is the great advantage the beſieged have over the beſiegers when the latter firſt enter the ditch to make their lodgment there.

M. *Blondel* and ſome other Ingineers think it would be an advantage to have the ditch and counterſcarp fill'd with * caponieres, † coffers, and conceal'd lodgments; ſome would have the caponiers cover'd, not to be plung'd into from the brink of the counterſcarp; others would have them open, that the muſqueteers within may not be blinded by their own ſmoke; ſome are for placing them before the flanks, others for having them run acroſs the ditch, from the angle of the ſhoulder. M. *Vauban* makes them begin at the middle of the curtain, and carries them quite acroſs the ditch, to ſerve likewiſe for a communication with the ravelins.

* A ſunken lodgment uſually made by the beſieged in the ditch, when a dry one, and rais'd about two foot above it, with embraſures to fire thro' upon the beſiegers, to repel them in their paſſage.

† A work much like the caponiere, only with a thin brick or ſtone wall, loopholed, inſtead of a parapet of earth.

M. *Coehorn*, the better to defend the dry ditch of the retrenchment of his baſtion, makes underneath the counterſcarp or terre-plain of the face of the baſtion, a gallery or caponiere of maſonry covered with a foot and a half of earth; that gallery is full of air-holes, to carry off the ſmoak, and has its paſſage divided by ſeveral doors at two or three toiſes diſtance. It ſerves likewiſe as a way to paſs from one tower or orillon to the other; and to preſerve a communication with the entrenchment, another gallery of ſtone-work, loophol'd, is carried from the falliant angle acroſs the ditch, cover'd with planks and earth a foot and half thick; there is another almoſt of the ſame kind carried acroſs the dry ditch from the retrenchment in the ravelin; beſides which at the extremity of that ditch, on each ſide the retrenchment, are coffers of ſtone, loophol'd, and rais'd four feet above the horizon; they are cover'd with earth and planks, and have a ſmall ditch before them from four to ſix toiſes wide.

There are very few Ingineers who do not think ravelins before the curtains abſolutely neceſſary, becauſe till theſe are taken the enemy cannot paſs the ditch to come at the face of the baſtion; ſo that by their means he is kept at a diſtance from the place, and when he would approach it, they oblige him to advance ſtep by ſtep, by the frequent checks they give him, and the continual danger he is in of being enfiladed

filaded or ſeen in reverſe; beſides which, they cover the ports and the flanks from the beſiegers batteries in the field. Thoſe Ingineers who diſapprove of them, object to their expence, and the great numbers required to defend the place which has them; that when the ditch is a wet one, there is no entering them but by a bridge, which when once it is broke down by the artillery, no more ſuccours can be ſent thoſe in the ravelin, and farther, that when the enemy are once maſters of it, it furniſhes a very convenient place for bringing cannon thither, from whence to batter and ruin the flanks. The common practice however is againſt this opinion; there are very few conſiderable places fortified without ravelins, except *Palma Nova* belonging to the *Venetians*, *Groninguen*, and the Citadel of *Antwerp*; and it was the expence of conſtructing thoſe detach'd works, rather than any indifferent opinion of their uſefulneſs, was the reaſon of ſuppreſſing them.

Some Ingineers make flanks to their ravelins, others none. The latter ſeem to be the beſt. *Firſt*, Becauſe a greater ſpace of ground is taken into the ſame circumference. *2dly*, That when they are without flanks, one and the ſame piece grazes the entire face of the ravelin; and when there are flanks, there muſt be another to defend them. * The third reaſon is, that if the enemy would come to attack the face of the baſtion, before he has taken

* The following ſentence ſeems miſplaced here, being rather an argument for the uſefulneſs of ravelins in general.

ken the ravelin, thoſe in the latter may raiſe a battery of a few pieces in the demigorge, to command the others in reverſe, when they come to mount the breach; and the beſiegers cannot poſſibly diſmount thoſe cannon with cannon, having no place to raiſe a battery, but muſt abſolutely take the ravelin. The fourth reaſon is, that ravelins without flanks cover the place better, eſpecially the gates, the curtain and the flanks.

Thoſe who are for having flanks to their ravelins, ſay they defend better their neighbouring baſtions, and prevent the making lodgments on the counterſcarp, and that the angles of the ſhoulders become ſtronger thereby. In thoſe places M. *Vauban* has fortified, he has made uſe both of the one and the other manner.

Some are for having the ramparts of the ravelins not above eight feet higher than the level of the field. M. *Coehorn* would have them only four feet above the horizon, but raiſes the faliant angle of the parapet higher to prevent enfilades. Others again would have them only three feet lower than the body of the place, becauſe when the ravelins are low, the enemy can raiſe cavaliers, and mounting cannon upon them, drive out all who ſhould defend them. Thoſe who are of the firſt opinion reply, that if thoſe cavaliers are made near the ravelin, it is not to be done without a good deal of expence both

of

of time and people, and if they are a-far off, they muſt be rais'd to an extraordinary height to have that ſuperiority over the ravelin; that the advantage of making the ravelins low, is that the enemy can never make breach in them from the field, beſides which, they partake better of the defence of the place.

M. *Coehorn* gives the rampart of his ravelins a parapet of twenty feet wide at the top, and a banquet and terre-plain of ſeven.

Blondel and ſome others give no greater breadth to the ramparts of their ravelins, than is neceſſary for the recoil of the pieces on their batteries; others would have them wider, in order to retrench the breach.

Some Ingineers have propos'd to make the terre-plain of the ravelins, and of all the reſt of the out-works, even that of the cover'd way, only ſix inches above the ſurface of the water, that the beſieged may find no ground to make their lodgment. *Coehorn* ſinks the ditches of the retrenchments in his baſtions, within half a foot of the level of the water; thoſe of the ravelin the ſame; makes the cover'd way of the counterſcarp on the ſame level, and gives the latter a continued decline to the very brink of the water in the ditch. He pretends by this means to oblige the beſiegers to carry the earth which is to cover them, the diſtance of thirty-eight toiſes in the ditches of the retrenchments of the

the ravelins, and in ſome places as far as eight and fifty toiſes. This without diſpute is a conſiderable advantage, but it is only to be put in practice in places that lie very low; it would be work of too much labour any where elſe, as well as a troubleſome buſineſs to diſpoſe of the earth.

The Chevalier *Tenſini* is for making low flanks at the extremity of the faces of the ravelins, to defend nearer at hand the paſſage of the ditch with great and ſmall arms. Others condemn them, and ſay they may ſerve to cover the beſiegers when they are making their paſſage. That thoſe flanks are uſeleſs as ſoon as the enemy is lodg'd in the place of arms, near the rentring angle, becauſe from thence he can eaſily either oblige the beſieged to abandon them by the fire of his ſmall arms, or by throwing grenades, ſhells, or other fire works into them; beſides which they give the enemy an opportunity of entering the ravelin through the gorge. M. *Vauban*, when the ditch is a dry one, contents himſelf with making places of arms there.

The retrenchments and redoubts which moſt Ingineers are for making in the ravelins, are generally approv'd of; nothing farther can be objected to them, but the expence of their conſtruction, and of the additional men and ammunition neceſſary for their defence.

All

All think it proper that the retrenchments and redoubts ſhould have revetments, that they may not be liable to be taken ſword in hand: and that their ditches, if it is poſſible, ſhould be dry ones, for thoſe within to have it in their power every moment to get at the beſiegers, to throw grenades amongſt them, or to ſally and diſturb them in their lodgments. In that retrenchment of the ravelin, M. *Coeborn* makes beſides, at the gorge of it, a caponiere of maſonry covered with thick planks and earth, and before it a redoubt in the form of a bonet, and encloſes the whole with a row of paliſades.

What Ingineers ſay in regard to ravelins, they ſay of counterguards likewiſe; the general intent of which is to intercept the view of the faces and batteries in the oppoſite flank from the counterſcarp and field. Some of them give thoſe counterguards a rampart wide enough for the troops to draw up in order of battle, to ſuſtain an aſſault, and to retrench themſelves there; others make only a parapet, with two or three banquets, that when the enemy become maſters of them, they may not have ground to raiſe batteries. *Coeborn*, in his firſt method of a royal hexagon, allows only twenty feet for the width of the parapet of his cover-faces above, and from twenty eight to thirty three feet at the bottom. *Blondel*, for the ſame reaſon, would have them all of maſonry, and countermined, to deprive the beſiegers

beſiegers of all poſſibility of placing cannon there, after they have forced them.

Some Ingineers, to ſave a part of the great expence of counterguards, place ravelins before the points of the baſtions; it is certain thoſe works are leſs expenſive, but they cover the flanks only, and don't at all intercept the view of the faces.

All Ingineers agree, that the counterſcarp ought to have a revetment when the ditch is a dry one, and likewiſe that it is an advantage to have one, when the ſurface of the water in the ditch at the higheſt is a good deal lower than the terre-plain of the cover'd way; and that the only caſe in which a revetment is of no great advantage, is when the ſurface of the water is very near even with the terre-plain of the cover'd way. Thoſe Ingineers take it for granted at the ſame time, that the earth is of a ſufficient conſiſtence to ſupport itſelf, otherwiſe there would be a neceſſity for the counterſcarp's having a revetment to preſerve both the breadth and depth of the ditch.

Ingineers are all likewiſe agreed as to the uſefulneſs of a cover'd way, tho' not as to the diſpoſition of its parts; ſome would have it ſunk into the counterſcarp, others are for raiſing it above the level of the field, and more ſtill are for taking one half out of the counterſcarp, and raiſing the other above the level of the field; the laſt method is the beſt becauſe in that the fire of the ſmall arms grazes

the

the glacis well, and that of the beſiegers cannot plunge into the cover'd way, whereas both the other methods are ſubject to inconvenience in one or other of thoſe points. When cover'd ways were firſt in uſe they had no more than three toiſes in breadth, which was not ground ſufficient for the troops to march and countermarch, appointed to defend them. *Blondel* is fallen into the other extream, he would have them from ſeven to eight toiſes wide, for the troops to draw up in order of battle there, by means of which extraordinary breadth they are more expoſed to plunging ſhot from the field, and leſs protected by the work they cover; beſides there is no neceſſity for the troops having ſo much ſpace. The beſt defence of a cover'd way doth not always conſiſt in maintaining the ground with obſtinacy; the ſucceſs of ſuch a way of proceeding is too precarious, and the loſs too conſiderable if it ſhould not ſucceed.

The branches of them likewiſe are made ſeveral ways; ſome are for carrying them on in direct lines, others for making talliant angles from ſpace to ſpace, or works of ſome other form that flank each other reciprocally.

To avoid being enfiladed, ſome make them indented, or with teeth like a ſaw, as the Chevalier *Tenſini*; others are for having traverſes in them from ſpace to ſpace; the latter is the beſt method for the purpoſe, but they ought not to be made to join the ſubſtance of the parapet of the covered way, as has been practis'd by

by ſome Ingineers, and the paſſage lie on the ſide next the counterſcarp, becauſe when the enemy have once made themſelves maſters there, they will be under cover of thoſe traverſes. The paſſage ought to lie between the traverſe and the parapet of the cover'd way, and ſhut up by a merlon jutting out from the parapet. Some Ingineers have another way of covering thoſe paſſages, they cut away a ſpace of four foot and a half within the parapet, or elſe make the branches of the cover'd way with doubles or returns to cover the paſſages. The former of the two laſt methods is only proper for covering the paſſages at the rentring angles, which are either flank'd by the ravelin, or by the body of the place, but is of no uſe to cover thoſe of the ſaliant angles, becauſe the cavity is not ſeen from thence, and the beſieg'd may lodge themſelves there. To the ſecond it is objected, that as faſt as the beſiegers advance their ſapp on the head of the parapet, and lodge themſelves on the crook'd return of the cover'd way, the beſieged are obliged to abandon the great branch entirely, where they find themſelves enfiladed. Whereas when each branch is in a direct line, the beſieged may diſpute their covered way inch by inch, becauſe they can only be plunged into from the front, but never enfiladed.

The old Ingineers made no places of arms at the rentring angles of the cover'd way; at preſent

preſent all agree in the neceſſity of them, for flanking and nearer defending the branches.

Some would have lunets in them, the better to grace the glacis, and to maintain the cover'd way; they even pretend, that by the help of thoſe ſmall works the beſieged may raze any lodgment the enemy ſhall make on the paliſade with eaſe, as often as he pleaſes. That the beſiegers will find themſelves under a neceſſity of attacking them, and when they have taken them can make no uſe of them. *Blondel* has made them, in his new method of fortification, for thoſe very reaſons, and likewiſe to prevent the flanks of his baſtions from being ſeen obliquely from any part of the field.

M. *Coehorn* is ſatisfied with making ſmall redoubts of maſon work there, loopholed, a brick and half, or two bricks thick, covered with a row of paliſades to prevent the enemy from opening them with a petard.

The better to ſuſtain the cover'd way, on the glacis ſix toiſes before the place of arms, he makes coffers or caponieres, and pretends by defending them with ſmall arms, and half-pikes, to keep the beſiegers off from the place of arms, and to prevent them from throwing in grenades there. The inconvenience of thoſe coffers is, that by means of wool-ſacks, gabions, and faſcines, the enemy may prevent their effects, and that it is not impoſſible either to ruin them with cannon from the field, or to demoliſh them with ſhells, as he raiſes them a foot

and half above the eſplanade or glacis, and covers them only with plank and turf.

There are likewiſe various ſentiments as to the manner of planting the paliſades. M. *Vauban* has wrote a diſſertation upon this ſubject, the moſt material part of which we have extracted, and ſhall here inſert it.

'There are four ſeveral ways of planting 'paliſades on the cover'd way; the firſt, and 'moſt ancient way, is to ſet them on the 'head of the parapet within two foot of the 'border, and riſing three feet and a half above 'it. The good properties of theſe paliſades is 'the keeping the cattle out of the cover'd 'way, and preventing the enemy from in-'ſulting it before the trenches are open'd. The 'bad ones are as follow. *Firſt*, They ſerve 'as a mantelet to the enemy, and intercept 'the greateſt part of the fire of the place, 'when they are lodg'd behind them. *Secondly*, 'They are eaſily cut down, as the enemy can 'march directly up to them at any time. '*Thirdly*, There is no repairing thoſe that are 'broken in the attack, without being expoſed 'to the enemy at the ſame time. *4thly*, They 'are too fair a mark for the cannon, inſomuch 'that the enemy before he comes to attack 'the cover'd way, can break down what part 'of them he pleaſes with his batteries, to open 'himſelf an entrance, which the beſieged can 'no ways prevent, and for which reaſon the 'uſe of them is laid aſide.

Blondel

Blondel had condemn'd them before M. *Vauban*, becauſe, ſays he, 'tis eaſy for the beſiegers to break down any part they pleaſe of them with their cannon, and to leave any part ſtanding, to ſerve as a breaſt-work, by laying faſcines againſt them, or other materials, to cover them from the enemy. The *Spaniards* formerly planted them in this manner, with which M. *Goulon* charges them in his Memoirs of Attack and Defence. See his objections to thoſe kinds of paliſades. 'The 'Spaniards ſet their paliſades upon the pa-'rapet of the cover'd way, which intercept 'half the fire of the place, and give the work-'men an opportunity of making their lodgment 'with eaſe; tho' the ſoldiers, ſtupid by nature, 'neither know what they are about, nor whi-'ther they are going; but at that time there 'being nothing more to be done but to march 'forward, they follow their Ingineers and 'their officers, till running their head or ſto-'mach againſt the paliſade, down drops the 'faſcine at their foot, and thus the lodgment 'becomes traced out, which is afterwards per-'fected without difficulty by the skill of the 'Ingineer.

* 'The ſecond manner is to plant them with-'in the cover'd way, cloſe to the parapet, and 'riſing three feet and a half above it. The good 'properties of this ſecond kind of paliſades are, 'that ſuch of them as are broken may be re-

* M. *Vauban.*

'pair'd with ſafety, and under cover; the keeping off the cattle, and preventing the cover'd way from being inſulted as before. For the reſt, they have the ſame defect in common with the foregoing, for which reaſon they are not made uſe of at preſent.

'The third manner is, To plant them upon the banquet, near the foot of the parapet, at a foot and a half's diſtance from it, meaſuring from the inſide of the croſs-bar to the ſummit of the parapet, which their points exceed by a foot. The good properties of this ſort, are, *1ſt*, They are not to be cut down. *2dly*, There is no leaping over them without great difficulty and danger. *3dly*, There is ſcarce a poſſibility of their being damaged by the cannon, which can only take the points of them, can make no great ſplinters, never diſtrange the whole frame, and very rarely plunge within the croſs bar. *4thly*, The poſſibility of taking away or replacing thoſe which are wanting, as it may be done under cover. *5thly*, They no wiſe incommode the cover'd way, ſtanding cloſe to the parapet, to which they are even an ornament. Their defects are, *1ſt*, The difficulty of placing the ſand-bags, which cannot be done without expoſing the perſon, or ſupporting them with a kind of treſſels ſet behind; the one is difficult and troubleſome the other too dangerous. *2dly*, Suppoſing the row of ſand-bags ſet upon the head of the parapet, you can only fire in a direct line before you, be-

'cauſe

'cauſe the interſtices of the paliſades and 'loopholes betwixt the ſand-bags will not allow 'aſlanting of the muſquet to the right or left. '3*dly*, 'Tis objected to them, that the opening 'thoſe barriers through which the troops ap-'pointed to ſally are obliged to file off, occa-'ſions their being too much expoſed, and pre-'vents the ſally having any great effect, which 'however doth not exclude the uſe of thoſe 'barriers, being neceſſary both for the ſally-'ing and retreating of the horſe, and likewiſe 'often for the foot; which defect therefore is to 'be conſidered as mingled with ſome good qua-'lities. This method of planting paliſades is 'practiſed in all our fortified towns.

'The fourth manner is a new one, and has 'only been practis'd at three or four ſieges, 'where they pretend it has anſwered well. 'They plant the paliſade within four and a 'half, or five feet of the foot of the parapet, to 'which it is juſt equal in height, and cut bar-'riers, and ſmall openings of three foot and a 'half wide in it, at every ten toiſes diſtance. 'This kind of paliſade has the good properties 'following. 1*ſt*, It is in ſtill leſs danger of be-'ing ſhatter'd by the cannon than any of the 'former, as it is not ſeen at all by the enemy. '2*dly*, It can neither be leapt over, nor cut 'down, while the beſieged defend it with re-'ſolution; for otherwiſe it is eaſier cut down 'than the former, becauſe the enemy throwing 'himſelf in betwixt the paliſade and the para-

'pet, is there half cover'd by the paliſade it-
'ſelf. 3*dly*, The conveniency of replacing the
'broken ones under cover. 4*thly*, The eaſy
'ranging of the ſand bags, which is likewiſe
'to be done under cover. 5*thly*, The oppor-
'tunity of ſallying on a ſudden, when leaſt ex-
'pected, by throwing themſelves at once over
'the parapet, and retreating after the ſame
'manner. 6*thly*, The opportunity of making
'a better and more reſolute defence of the co-
'ver'd way, by keeping cloſe up to the pali-
'ſade. This latter is very hazardous, and
'hardly practicable. The defects of this pa-
'liſade are, 1*ſt*, Its being greatly expoſed to
'the plunging fire of the enemy both on the
'front and flanks, as ſoon as they have gain'd
'the head of the parapet. 2*dly*, The expo-
'ſing thoſe troops who are reſolutely to de-
'fend the cover'd way, to the uncertain fire
'of the rampart and ravelins which ſhould
'protect them, whoſe parapets being much da-
'maged at the time of the attack, 'tis ſcarce
'poſſible but thoſe of the place muſt hurt their
'own people when the attack is made in the
'day-time, much more when made in the night;
'which together with the ſhowers of grenades
'thrown in there by the beſiegers, render the
'defence of thoſe paliſades exceſſively dangerous
'in the day-time, and in the night inſup-
'portable. 3*dly*, The greatly expoſing the
'men betwixt the parapet and paliſades, both
'to the burſting of the grenades, and to the

'danger

'danger of not having it in their power to retire in time, when the enemy sallies from his places of arms to attack them. *4thly*, The borders of the parapet are in a little time 'strangely broken by the sallying and retreating of the troops, who come in rather 'head than feet foremost; which defect however is not very considerable, and may easily 'be repaired.

M. *Vauban* says, that in the campaign in *Holland*, he saw another sort of palisade on the cover'd way at *Nimeguen*, upon the head of the parapet there, 'it was no more than a row of 'trees, whose stocks were set in the ground, 'having their principal branches sharpened 'as they happened to grow, from three to four 'foot long, and interwoven one with the 'other, resembling in that the lines of *Alexia*. 'It is indeed much more proper for retrenchments of that kind, than for the border of a cover'd way, having all the defects 'of the first and second sort, for which reason 'it deserves no place here.

'Some Ingineers double the palisades of the 'places of arms in the rentring angles, following the third and fourth method of planting 'them, in order to a more resolute defence of 'them. These were said to have answered very 'well at *Grave*, *Mayence*, and lastly, at *Keiserwert*.

'The third and fourth manner of palisading, 'are the best beyond dispute, but both one and

'tother have very great defects, though of the two the laſt is to be preferr'd; becauſe in that a reſolute defence of the cover'd way is leaſt hazardous, as thoſe of the place may venture in open day-light, upon occaſion, to fire over the heads of them who defend it, the latter being ſo much underneath them, but not in the other method, where they are raiſed ſomething higher. The beſt defence of the cover'd way, in my opinion, doth not conſiſt in obſtinately maintaining the ground, that advantage is too dearly purchas'd, and, ſooner or later, you are ſure to be driven out with loſs. I ſhould rather chooſe to give up to the enemy for a time, thoſe parts which are moſt within the command of the place, and after obliging them to ſuſtain the fire of the place and outworks, and their defences well lin'd for the ſpace of half an hour or three quarters, then to return into it again; ſuch a fire given at eaſe and leiſure, without conſtraint, could not fail of a great effect; it might perhaps be poſſible for the beſieged to maintain their ground in the places of arms, by means of double paliſades, while at the ſame time, the fire of the place acted upon the branches of the ſalant angles on the right and left of them: This fire, however, could not but be extreamly hazardous, even in the day-time, as ſoldiers are awkward, and take but little care how they level their pieces; for which reaſon I hold it the beſt, at leaſt the

'ſecureſt

'ſecureſt way to keep but a ſmall number of 'men in the cover'd way, with orders to retire 'into the neareſt places of arms upon the right 'and left of the attacks, where ſtrong detach-'ments ſhould be kept ready to ſally out on 'both ſides, one over the glacis, the other a-'long the cover'd way, and this to be varied 'and repeated whilſt attended with any ſuc-'ceſs.

'The right courſe to be taken, is to plant 'the upper paliſade at the time of the turfing 'the parapet of the cover'd way all about 'the place, to keep it in continual repair, 'and the lower range either to be laid by in 'the magazins, or piled up and cover'd with 'ſtraw, and never to plant them before the 'time of ſiege, nor then, till the attacks 'are known, and before the front intended 'to be attack'd. There is no farther pro-'viſion neceſſary for that purpoſe; I ſhould 'even think it unneceſſary to double the pali-'ſade, except at the places of arms in the ren-'tring angles, being the only parts that can be 'obſtinately maintain'd; at leaſt, there ap-'pearing to me no others that are capable of 'it; and as to the upper paliſades, they may be 'improv'd by diſpoſing them in ſuch a manner 'that the intervals may be equal to the breadth 'of the paliſades, and driving in a tenter hook '3 inches long betwixt them. The croſs bar 'of the paliſade ſhould be faſten'd with pegs, a 'foot or fifteen inches below the parapet, the

'head

'head of the paliſade riſing nine inches above it, 'ſharpen'd to a point of twelve inches long, 'and planted within ſix or eight inches of the 'foot of the parapet; ſo that the horizontal 'diſtance betwixt them, at the ſummit of the 'paliſade, will be a foot and half, excluſive of 'the thickneſs of the latter; thus the ſoldier, 'who fires over the head of the parapet, will 'ſtand at two foot diſtance from it. Suppo-'ſing then, that the ſand bags, when ſome-'thing preſſed down, take up a foot in breadth, 'the fuſil, which is three feet eight inches in 'barrel, will extend eight inches beyond them, 'which is as much as need be deſired on ſuch 'an occaſion.

'Tis indiſputable, that by enlarging the intervals betwixt the paliſades, by farther tapering the points, and not making them higher than nine inches above the parapet, a remedy is found to prevent the ſplintering of the paliſade, and likewiſe for the inconvenience of not being able to ſlant or traverſe the muſquet ſufficiently, as well as for the difficulty of ranging the ſand-baggs; however, in the late defences of towns, this laſt method has not been followed exactly, the bent nail or tenterhook has been omitted, and the paliſades brought again within four inches diſtance of one another.

M. *Coehorn* has given us paliſades of a new kind, ſo contrived as either to be ſet up an end, or let down at pleaſure, they are fix'd upon an

horizontal beam, which turns round, is about two toiſes in length, and ſupported by two ſpindle-poſts fix'd in the ground. He has a great opinion of theſe paliſades; firſt on account of the good husbandry of them, as they are never to be ſet up but at the time of attack. *2dly*, They are out of the reach of the enemy's cannon, as they are never ſeen, till the time of their making the aſſault on the cover'd way. All that can be ſaid againſt them is, that if one of the poſts or ſtakes happens to be broke down by a ſhell, a ſpace four toiſes long muſt want paliſades for ſome time.

Some Ingineers are for carrying away all the earth round about the place, within the reach of muſquet ſhot, till you meet either with rock or water; or if neither ſhould happen, after digging three or four feet, the void ſpace to be fill'd up with flints and ſtones, and cover'd only with a foot of earth thrown over them; the ſame thing to be done in the dry ditches. There can be no diſpute, but the beſiegers works would by this means be render'd extreamly difficult, but the expence of conſtructing the fortreſs would be encreas'd proportionably.

Some Ingineers are for driving ſtakes into the ground, cloſe to one another, and covering them over with earth. This can only be done in places near great forreſts, and even there not without very great expence.

Some

Some Ingineers ſay thoſe counterſcarps where there are no ſecond ditches, muſt be loſt the firſt attack, and for that reaſon, when the ſituation is low, would have ſecond ditches made at the extremity of the glacis, as in that caſe the beſiegers will not have it in their power to inſult the cover'd way till they have paſs'd them, which paſſage muſt be extremely difficult, being oppoſed by the whole counterſcarp juſt at hand; and the making their lodgment on the glacis no leſs ſo, as the enemy will be obliged to rank off, in order to paſs the bridges when they are coming to make their lodgment; beſide the advantage of thoſe ſecond ditches furniſhing a ſufficient quantity of earth to raiſe and widen the ramparts of the works; others again think them prejudicial, as they are an obſtacle to the ſallies in their iſſue and retreat, as well as to the receiving of ſuccours: They condemn them ſtill more when they are liable to be drain'd, becauſe when laid dry they afford a lodgment or place of arms almoſt ready made at the foot of the glacis.

Some Ingineers at this day being perſuaded that a place is no longer defenſible, but muſt preſently be taken, after the beſiegers are once lodg'd upon the ditch ſide, becauſe of the numerous train of artillery employ'd at preſent in the attacks of towns; and prejudiced likewiſe by the obſtinate reſiſtance made by ſome ſecond cover'd ways in the late wars, look upon thoſe works as the beſt of the whole fortification

when

when ſuſtain'd by grazing lunettes, placed either at the ſaliant or rentring angles. Others acknowledge theſe latter afford no mark to the cannon, but condemn them on account of the numerous and ſtout garriſons required to defend them as they ought; and becauſe when taken, they furniſh the beſiegers with places of arms ſecure againſt all ſorties, and extremely commodious for attacking the firſt cover'd way. They acknowledge the neceſſity of a ſtrong garriſon, not only as the lunettes and front attack'd muſt be well furniſh'd with troops, but becauſe more troops will be wanting for advanc'd guards upon the right and left to prevent the beſiegers coming and attacking upon the flanks thoſe guards of the ſecond cover'd way. They likewiſe own the neceſſity of having ſtout fellows, as thoſe works require great reſolution to defend them; for if once they are loſt, 'tis impoſſible to drive the beſiegers out again, without putting all to the hazard. By all we have been now ſaying on this ſubject of ſecond cover'd ways, it plainly appears that the ſecond counterſcarp which M. *Coehorn* makes in his ſecond method beyond his ſecond ditch, is by no means capable of making a great reſiſtance.

A great many Ingineers ſay with *Blondel*, that it would be of great advantage, if the whole were countermined, both the ramparts of the place, the ditch, the outworks, and the counterſcarp; thoſe countermines to be of va-

rious

rious depths, and on different levels; and branches carried out extending a great way into the country; the mines to be correſpondent to known ſpots above-ground, in order to ſpring either the nearer or more diſtant ones upon occaſion, or even thoſe underneath the chief works of the enemy's attack.

M. *Coehorn* propoſing ſuch methods of fortification as are only practicable in ſituations of very low horizons, would have counter-mines only under the ramparts of the body of the place. He makes two galleries in each wall, which is all he tells us, not chooſing to impart his ſentiments to the publick, either concerning the diſpoſition or conſtruction of them.

No Ingineers condemn the uſe of mines, tho' ſome think it worth conſideration, the great expence required to furniſh the whole circumference of the place with them in the manner *Blondel* preſcribes, and that they are not practicable in all ſituations. That ſuch high ſituations are rarely met with as admit of the conſtructing them in the manner Ingineers propoſe. That the ſoldiers dread of them doth not proceed ſo much from the examples of their great effects, as from a prepoſſeſſion that it is not in the power of valour or courage, how highly ſoever exerted, to extricate them from the danger. Laſtly, that the execution of them in time of action is liable to many inconveniences, which often fruſtrate their effects. That thoſe which are to be ſprung beyond

beyond the glacis cannot do any great execution, because, take what measures you will, it is not possible to place the fourneaus directly under the line of the trenches: That the danger of them may be avoided by observing the following precautions; by opening the trenches as near the place as is possible, and pushing them on till you reach the foot of the glacis with such swiftness and speed, that the besieged may have no time to carry out new branches, or to load his mines, supposing he had time to make them: By placing only small guards of eight or ten men in the most advanc'd works, and those from distance to distance, leaving the rest behind ready to march out against sorties. By sinking a number of shafts in the grand place of arms, or last parallel, and from thence carrying out several branches directly to the counterscarp, the springing of whose fourneaus should overturn the whole ground, as fast as the trenches advance above. Lastly they say, that observing the same conduct in the ditches and the ramparts, all those formidable stratagems can only retard the taking of the place for a few days, and that if there have been instances of the defence of a place having been greatly prolong'd by mines, it ought rather to be attributed to the unskillfulness and backwardness of the besiegers, than to any great difficulties they were put to, to preserve themselves from their effects.

SECTION

SECTION II.

Particulars to be conſider'd by an Ingineer in laying out the deſign of a Fortreſs.

IN order to adjuſt properly, and ſettle the plan of the Fortifications of a Place, ſeveral conſiderations are abſolutely neceſſary, on which the number, form and ſubſtance of the ſeveral works muſt depend.

Firſt, If the Prince is powerful, has but few places to fortify, and conſequently can afford to be at a great expence for the conſtruction, maintenance, and defence of that Place he propoſes; in ſuch caſe an Ingineer ſhould multiply the works on each front, giving them ſuch form and ſubſtance as he thinks moſt conducing to a good defence, whatever it may coſt the Sovereign.

He ſhould act after the ſame manner when employ'd by a Prince of ſlender power himſelf, but having powerful allies, greatly intereſted in his preſervation, and from whom he may promiſe himſelf all kinds of aſſiſtance, both for the conſtruction, guard, and defence of the place he intends to fortify.

If a Prince is weak of himſelf, and without aſſurance of powerful aſſiſtance from his allies, prudence ſhould direct the Ingineer to engage in no expences beyond his finances; and in ſuch a Prince's ſervice never to undertake works which cannot be executed but at an exceſſive expence.

Secondly, When a place is expos'd to the attacks of powerful enemies, an Ingineer ſhould endeavour to augment its ſtrength by adding as many works as the power of his Sovereign will admit of, or the finances he is pleas'd to appropriate to that expence.

If a place is out of all poſſibility of being beſieg'd by a powerful army, a good body of a place, and good ditch are ſufficient; of this kind are thoſe places poſſeſs'd by the *European* Princes in the *Eaſt* and *Weſt Indies*.

If a place has nothing to fear beyond the incurſions of Banditti or Savages, or a few Maroders, whoſe object is rather plunder or contribution than making themſelves maſters of the place, it ſhould be fortified in the ſimpleſt manner poſſible; it is ſufficient, if ſurrounded with a curtain and ſmall baſtions, a narrow ditch, little rampart, and the reſt proportionable.

Thirdly, The temper and conſtitution of thoſe who are to defend it, and of thoſe expected to attack it, are likewiſe to be conſider'd by an Ingineer; each nation has its peculiar talent in war, and one of the chief points of skill in a

General, is the knowing how to make the beſt uſe of that talent.

Some on account of their phlegm, great perſeverance, and reſolution, as the *Spaniards*, are extremely proper for the defence of a place where a continual fire is to be made from behind a parapet: When a place is to be defended by a people like theſe, nothing farther is neceſſary but that the works be good in their kind, capable of being defended, and not to be carried ſword in hand; that is to ſay, the ditches in particular to be deep and full of water, or if they are dry, the walls to be very ſtout, high enough to be above the reach of all inſults, a very ſubſtantial rampart and parapet, to graze the glacis well with their fire, and an open view on all ſides.

Others by their natural impatience and forwardneſs, as the *French*, grow ſoon weary of that kind of defence, and prefer ſuch works as are to be defended ſword in hand: Where the garriſon is to be compoſed of troops like theſe, there is no occaſion for great exactneſs in the body of the place, but a neceſſity for good cover'd ways, and advanc'd pieces of chicanry, ſuch as may require long labour and trouble on the beſiegers part, to oblige the beſieged to abandon, and very vigorous efforts to make themſelves maſters of them in any reaſonable time.

Some nations are never diſhearten'd by the tedious labours they are obliged to undergo, in

in order to gain the enemy's works inch by inch, and had rather work hard four and twenty hours, than be expoſed a ſingle one to danger; when the beſiegers are of this ſtamp, work behind work muſt be prepared to oppoſe them, accompanied with all poſſible chicanry, to augment and protract the difficulties of the attack.

Others are not capable of going through thoſe tedious formalities, without growing weary and diſcouraged; when the beſiegers are of this temper, an Ingineer on the contrary need make but a few works to oppoſe them; ſuch however as are proof againſt a ſurprize, or ſword in hand, and accompanied with whatever may oblige the beſiegers to advance ſtep by ſtep in their attacks; as good ditches and very high ramparts, yet not ſo high as to afford too fair a mark to the cannon of the enemy.

As to thoſe populous nations who care not what numbers they loſe in their attacks, provided they can but ſucceed, care muſt be taken to build ſuch works to oppoſe them as may be proof againſt all efforts of ſword in hand, eſcalade, or ſurprize; ſuch as it would be exceſſively difficult, or rather impoſſible for them to make themſelves maſters of, without laying ſiege to them in all its forms.

Thoſe who have never given themſelves the trouble of remarking the different qualities nature has given different nations, will doubtleſsly think theſe reflexions puſh'd too far, but if they will look into Hiſtory they will find

what we are now advancing confirm'd by numerous examples.

Fourthly, Regard muſt be had to the purpoſe for which the Fortreſs is deſign'd, whether it be for an offenſive or defenſive one: If it is intended to bar the entrance of a State, and there be no poſſibility for an enemy to penetrate without firſt making himſelf maſter of it, it is the duty of an Ingineer to fortify it in ſuch a a manner, at may cut off all hopes in the beſiegers of being able to carry it, without great expence of time, labour, and people. If the place is of no farther importance but only in regard to itſelf and its dependance, an Ingineer ſhould proportion the expence of the works to the revenue the Sovereign receives from the town; inſomuch that if the revenue is inconſiderable, and the intention of the Prince in fortifying it is only to give the inhabitants ſome mark of his paternal care, the Ingineer ſhould fortify it after the beſt method, yet managing the whole with ſuch œconomy, as not to ſtraiten the Sovereign in his other more neceſſary expences.

If the Fortreſs is intended for an offenſive one, that is to ſay, is built for ſtowing proviſions for the ſubſiſtance of an army, and ſuch a quantity of ammunition as may be neceſſary for any intended expedition, and that enterprize perform'd, it is of no farther importance to keep the place; the Ingineer ſhould content himſelf with fortifying it in ſuch a manner

as

as to be proof againſt all attacks either of ſurprize, or ſword in hand: But if he has reaſon to doubt the ſucceſs of that enterprize, and in caſe of ſuch miſcarriage, the loſs or taking of thoſe magazines may be of ill conſequence to the State, affording the enemy the means of farther extending his advantage already gain'd, the Ingineer, in ſuch a caſe, ought to fortify it with as much care and caution as if it were the key of the State.

Fifthly, The advantages and diſadvantages of a ſituation in general, are likewiſe to be conſider'd, in order to have recourſe to art, according as it may be more or leſs neceſſary.

If the air is unhealthy, the quantity of water inſufficient, or in the beſiegers power to cut off, it would be a folly in an Ingineer to laviſh vaſt ſums to make ſuch a Place exceeding ſtrong, becauſe either of the two defects we are now ſpeaking of, is ſufficient to oblige the beſieged to capitulate, even tho' they were not preſs'd by an enemy.

An Ingineer having a place to fortify, too ſmall to contain a garriſon capable of giving that army any diſturbance who ſhould leave it behind or on one ſide, in like manner ought not to be very intent upon multiplying its defences, becauſe the enemy, if he pleaſes, may march on without being under any neceſſity of attacking it.

If a Place is ſubject to a command, an Ingineer ſhould have recourſe to all that art can

furniſh as a remedy for that defect, with more or leſs attention to the expence, as the place is of more or leſs importance.

If a Place is difficult of attack by open force, and eaſy to defend, or to explain myſelf better, if it is ſo advantageouſly ſituated as not to be taken but by famine, an Ingineer to avoid putting his Sovereign to any unneceſſary expence, ſhould only aſſiſt nature where ſhe is defective, but at the ſame time he ought to take particular care, that whilſt he is deſirous by this means to pay his court, he doth not leave it in the power of the beſiegers, ſome way or other, to make an eaſy paſſage to the place.

If the ſituation of a place is ſuch as eaſily to be ſuccour'd at pleaſure, there is no neceſſity for ſo ſtrict an attention to the augmenting of its ſtrength by multiplying the works, that ſingle natural advantage exceeding all that art can beſtow; experience hath convinc'd us by many inſtances, that the longeſt and moſt vigorous defences have been made by ſuch towns as have had the opportunity of ſhifting their garriſons at pleaſure, and where it was eaſy throwing in ſuccours of any kind.

But where the ſituation is ſuch, that it is impracticable either to throw in ſuccours, or to ſhift the garriſon after it is once beſieg'd: If ſuch a place is liable to be attack'd by force, that defect ſhould be remedied by making an augmentation of good works, and ſuch as may be capable of defending themſelves.

Places

Places whoſe ſieges may eaſily be rais'd, require no better condition of defence than ſuch as may enable them to maintain their ground a few days longer than the time requiſite for the Sovereign's drawing his troops together and marching to their relief. On the other hand, where there is no forcing the enemy to raiſe the ſiege, the Ingineer ſhould fortify the place in ſuch a manner as to protract and draw out the attack to the utmoſt length, that fortune may have time to interpoſe in the beſiegeds behalf, with ſome favourable accident.

An Ingineer ought in like manner to augment the number of the defences, when the place may be beſieged with any conſiderable advantage; that is to ſay, when the magazins of the beſieging army are very near at hand, and their carriage eaſy to the army; or when in the neighbourhood of the place is found a ſufficient quantity of proviſions, forage, water, and fewel for the army's ſubſiſtance; and they are neither liable to be incommoded by waters in their Camp, nor by the prevalence of any unfavourable ſeaſon. On the other hand, if all we have been now ſaying happens to be againſt the beſiegers, nature having ſo particularly favour'd the place in this reſpect, it would be unneceſſary there to employ the utmoſt aſſiſtance of art to enable the Fortreſs to make a long defence.

The want of Stone, Brick, Lime, Sand, and Earth in a country, is a reaſon ſufficient for not

giving a place all the ſtrength it might be otherwiſe capable of.

The barrenneſs or fertility of the country may likewiſe be a motive for an Ingineer to make the place more or leſs ſtrong; as ſuppoſing proviſions very ſcarce on the enemy's frontier, and the place capable of ſupplying them, that circumſtance is ſufficient to render it of importance, and on that footing the Ingineer ſhould regulate the fortifications.

The eaſe or heavyneſs of expence in conſtructing the works of a place, are likewiſe reaſons which may determine an Ingineer to enlarge or diminiſh the number of them, if the place is not of extreme importance.

Sixthly, An Ingineer ſhould conſider the particular circumſtances of the ground, whether advantageous or otherwiſe, to avail himſelf of the former, to remedy the latter, and to adapt ſuch works as are moſt ſuitable to each; in this the skill of an Ingineer properly conſiſts; for the greateſt part of what we have been otherwiſe ſaying, concerns not him alone, but the Miniſter and the Sovereign.

In laying out the deſign of a Fortification it is indifferent whether the whole be regulated by the interior or exterior ſide of the polygon. An Ingineer with a competent skill in Geometry may take either way, as beſt ſuits the particularities of the ground, without being obliged afterwards to make any alterations in what he may have already fix'd and laid down by a former method. When

When the fronts of a Fortification are of eaſy approach, without any particular advantages of ſituation, the lines of defence to be properly drawn, ought not to exceed muſquet-ſhot; but when thoſe fronts are any ways favour'd in their ſituation, more eſpecially in a caſe of neceſſity, thoſe lines may be farther extended, as when ſtanding on the ſea-ſhore, or border of a lake, great river, or moraſs, *&c.*

In polygons of a great number of ſides, it is beſt fortifying *à lignes fichantes*, or in that manner where the lines of the faces produced fall within the curtain; not only for the ſake of thoſe advantages we have already mention'd, but alſo to prevent the angles of the baſtions becoming too obtuſe, and that the reciprocal defence of the baſtions and ravelins may be leſs oblique. On the other hand, when the polygons have but few ſides there is a neceſſity for fortifying *à lignes raſantes*, or in that manner where the lines of the faces produced terminate at the rentring angle of the curtain, to prevent the angles of the baſtions becoming too acute.

An Ingineer ſhould always proportion his flanks according to the eaſe or difficulty of the approach, or attack of thoſe parts they defend; and both reaſon and experience have convinc'd us, that the beſt upon all occaſions are thoſe deſcribed by the cord of an arc whoſe center is the point of the oppoſite baſtion.

As the ſhoulders are intended to cover the flanks there is no doubt but thoſe flanks may be

be ſingle and in direct lines, when they are neither liable to be batter'd from the field nor from the ſide of the oppoſite counterſcarp; and on the other hand, when they are ſo expoſed, there is an abſolute neceſſity for giving them ſhoulders.

As it is certain the greater number of cannon the flanks will admit of to oppoſe thoſe brought by the beſiegers on the counterſcarp, the more difficult will be the ruining thoſe flanks; it follows that thoſe are of the beſt kind, which have two thirds of the whole extent of their flank under cover, and the remainder for the ſubſtance of the ſhoulder: Being the ſide of an equilateral triangle, whoſe baſe is the extent of the flank; and a body of maſonry of a circular form beſt reſiſting the efforts of cannon, it follows that is the moſt convenient one for the ſhoulder of every flank.

Cuſtom at preſent having eſtabliſh'd the uſe of a much greater quantity of ſhells than heretofore at the attack of places, there is no room to doubt but the artillery of thoſe flanks whoſe batteries are conſtructed in the form of an amphitheater, muſt very ſoon be deſtroy'd by thoſe machines; that they can be of no effectual uſe upon any occaſion; and that the beſt way therefore is to confine ourſelves to that ſingle upper battery of M. *Vauban*'s.

If a Prince has ſtrong reaſons for fortifying a place commanded by ſeveral riſing grounds, and

and it is impoſſible to prevent its being plung'd into upon the flanks, an Ingineer muſt unavoidably have recourſe to that method of making ſeveral cover'd vaulted batteries one above the other; that if the great guns on the upper flank happen to be diſmounted, they may make uſe of thoſe in the caſemates for the defence of the ditch and of the breach.

In polygons of few ſides an Ingineer is under a neceſſity of making the angle of the baſtion acute; in thoſe of a mean number of ſides, if he will fortify *à lignes raſantes*, he may make it a right angle; and in thoſe of a greater number of ſides, he may make it either right or obtuſe, as he thinks moſt proper, and fortify either *à la raſant* or *fichant*. When this is left to the option of the Ingineer, they generally give the right angle the preference.

The moſt perfect baſtions are thoſe of a middling extent; an Ingineer ſhould never make them little but when he is abſolutely confined by the irregularity of the ground; and there is no advantage in making them extraordinary large but when they are intended as platforms for a great number of artillery; as when lying cloſe to the ſea-ſhore, they are to defend either the entrance of a harbour, or the anchorage of a road.

When within the body of a Fortreſs there are ſeveral convenient places for building magazins, and the excavation of the ditches furniſhes more earth than is wanted to form the ram-

ramparts, it is proper to make the baſtions full; but if there are no good places for the magazines, and but juſt a ſufficient quantity of earth to form the ramparts, there is a neceſſity for making them void.

On a rocky ſituation of a ſmall extent upon the ſummit of an eminence, where there is a neceſſity for bringing the baſtions forwards upon the declining ſides of the hill, and either the ſeat of the curtain muſt be lower'd all around, or the baſtions rais'd extremely to be nearly on the ſame level; to avoid that expence, it will be moſt convenient to detach the baſtions from the rampart, at leaſt to ſet them lower down, and to make communications by poſterns. The upper town of Fort *Louis* is thus fortified.

When any one baſtion of a place is weaker than the reſt, being either eaſier of approach, or from ſome other circumſtance; the beſt way, if there is no remedy for that particular defect, is to make a retrenchment in the baſtion betimes, that it may be near equally as ſtrong as the reſt, and as capable of reſiſtance.

Where a quantity of earth is to be found in the environs more than ſufficient, and extremely proper for the works of the beſiegers, an Ingineer would act very indiſcretely to make very high ramparts to ſuch places; as all the cannon he could bring there could not much incommode them, having it in their power ſo eaſily to cover themſelves by the plenty and goodneſs

goodneſs of the earth; and thoſe cannon likewiſe being ſeen from many parts of the field, muſt, with great eaſe to the beſiegers, be render'd unſerviceable for the whole ſiege in a very ſhort time: as the enemy may begin to batter in breach as ſoon as they come within diſtance. In ſituations of this kind, an Ingineer ſhould bury his works in the ground, to be leſs ſeen from the field, and that the beſiegers may not be able to make breach till they are lodged upon the ditch-ſide.

It is quite otherwiſe in regard to places, whoſe environs are on a ſoil where there is no going ſix inches down, without either meeting rock, or water. In attacking ſuch fortreſſes, the beſiegers not finding on the ſpot as much earth as is neceſſary for their works, but being obliged to go farther a-field to look for it, and conſequently unable to carry on their approaches but at a very ſlow rate, and with great fatigue and danger: the Ingineer, to encreaſe all theſe difficulties, ſhould raiſe the ramparts of the place very high, that the cannon of the beſieged may overlook the country all round, and oblige the beſiegers to begin their attacks at a very great diſtance, and to make the parapets of their trenches and batteries higher and ſtronger than ordinary, not to be plung'd into or ſeen from the place. This is attacking the enemy on his weak ſide, or making the beſt uſe of a ſituation where they muſt want earth to cover them; and was what induced *Valperga*, who

who drew the plan of the deſign of
Cottonere, to make the ramparts an
high; and thoſe who have conden
upon this account, have made it evi
knew nothing of fortification.

In low grounds, where the ditch
fill'd with water, one may ſpare the
giving the works a revetment, if it is
and of a good conſiſtance; but if it
gravel, ſand, or turf, there is an
neceſſity for a revetment. The kee
ſuch ramparts would exceed conſide
expence of a revetment, and they wo
be able to ſupport themſelves againſt
a ſiege. In places of a high ſituation
where there is no water to be had in t
there is an abſolute neceſſity for g
works a revetment.

On fronts of places ſtanding cloſe
ſide, or on the border of a large lak
which there is no approaching but
veſſels: cannon being the only means
them to the bottom, are therefore
effectual for preventing their approac
as ſhot fired upon the water are le
than thoſe upon the land, the moſt adv
way is to make the parapets juſt of a
the guns to fire *en barbette*, to be ab
them on all ſides wherever the ene
preſent themſelves, or attempt to d
But at all the other fronts where
ditch, covered way, glacis, and whi

he deſign of *Malta* for
ramparts and walls ſo
have condemn'd him
made it evident they
ation.
ere the ditches can be
ay ſpare the charge of
ment, if it is a rich ſoil
ce; but if it is either
there is an abſolute
t. The keeping up of
xceed conſiderably the
and they would never
ſelves againſt cannon in
high ſituation likewiſe,
to be had in the ditches,
eceſſity for giving the

anding cloſe to the ſea-
f a large lake or river,
roaching but in large
e only means of ſending
are therefore the moſt
their approach; beſides
water are leſs certain
l, the moſt advantagious
apets juſt of a height for
ette, to be able to point
erever the enemy's ſhips
attempt to draw near.
fronts where there is a
lacis, and which are ac-
ceſſible

ceſſible by land, the parapets ought to be four feet and a half high for the muſqueteers, with embraſures made in them for the cannon, eſpecially when thoſe of the beſiegers are mounted in a battery.

The parapets ought not to be of maſonry, but where the place ſtands either on a very high rock, or where there is not a ſufficient quantity of good earth to form them, and where the ſhot fired obliquely from below can make but little impreſſion on the parapets above.

If by giving a great height to the ramparts to enlarge their command over the field, the foot of the faces, the ditches, counterſcarps and cover'd ways, become ill-defended, as muſt needs be the conſequence; the Ingineer in that caſe will be under a neceſſity of making a * fauſſe-bray, for placing cannon and muſqueteers in, to defend thoſe places from a nearer hand, and with a leſs plunging fire.

There is a neceſſity for doing the ſame thing at places ſituate on the brow of an eminence, where one is obliged to keep the ramparts up to a great height, in order to graze and defend all the ſlopes and avenues with their fire, which was the reaſon for making them at *Belgard* in *Rouſſillon*.

* A work much more uſed formerly than at preſent, built in the great ditch of the place, and rais'd about as high as the level of the cover'd way, conſiſting of a rampart and parapet, ſurrounding the body of the place, and of which the tenailles are a part.

In

In large places on a high ſituati
giving the works a revetment wo
great an expence, and where the di
be ſunk extremely deep to get bet
and eight feet water in them; a fa
likewiſe abſolutely neceſſary to defe
ſcent and paſſage. The great town
borough, *Lubeck*, and ſeveral others
Germany, are fortified after this man

The fronts of ſuch places as lie exce
and have neither counterſcarp nor co
to defend them, as thoſe on the brink
moraſſe, river, lake or ſea, ought to h
brays, to ſerve them either as keys o
teries againſt the enemy's ſhips that
proach; in theſe particular caſes fauſſ
not to be condemn'd; but on the con
extremely uſeful and proper.

Tenailles are always uſeful let th
what they will; but abſolutely neceſ
the fronts of irregular places, where
of defence exceed the extent of muſqu

When a place happens to be comm
ſome riſing-grounds, which are neit
levell'd nor taken in, but whatever
turn the works, will ſtill incomm
'tis here an Ingineer to keep the bui
of ſight, and fortifications from being
commanded in reverſe, and plung'd
thoſe eminences, ſhould have recour
to traverſes, but likewiſe to cavaliers
as the effects of cannon are to be de
when placed upon thoſe kind of work

high ſituation, where
evetment would be too
where the ditches muſt
p to get betwixt ſeven
them; a fauſſe-bray is
eſſary to defend the de-
e great towns of *Ham-*
ſeveral others in Lower
after this manner.
ces as lie exceeding low,
erſcarp nor cover'd way
e on the brink of a great
ea, ought to have fauſſe-
her as keys or for bat-
y's ſhips that would ap-
ular caſes fauſſe-brays are
ut on the contrary, are
oper.
s uſeful let the fronts be
olutely neceſſary before
places, where the lines
xtent of muſquet-ſhot.
ns to be commanded by
hich are neither to be
but whatever way you
ſtill incommode them:
keep the buildings out
ons from being enfiladed,
, and plung'd into from
d have recourſe not only
iſe to cavaliers, as little
n are to be depended on
e kind of works. If

If thoſe parts where the ramparts ought to ſtand are deficient of earth, and likewiſe the environs of the place; if the excavation of the ditches cannot furniſh them with a ſufficient quantity, but they muſt be oblig'd to fetch it from afar; and laſtly, if the expence of raiſing the ramparts to ſuch a height as is neceſſary in thoſe kind of ſituations, is found too heavy for the Sovereign's purſe; the Ingineer to ſave the greateſt part of that expence, ſhould content himſelf with giving them the uſual height, and only make in each front one or two cavaliers, capable of containing a certain number of cannon to play upon the field, and which plunging into the beſieger's works, may oblige them to make their parapets both higher and ſtronger than would have been neceſſary, if they had only the fire of the ramparts to guard againſt: Cavaliers are greatly advantageous in ſuch ſituations, notwithſtanding ſome Ingineers have abſolutely, but unadviſedly, condemn'd them.

Dry ditches are extremely good when cut in a rock, and made very deep, the place a large one, and the Prince able to maintain a ſtrong garriſon in it; on the other hand, wet ditches are beſt when the earth is of a kind eaſily removeable, the place a ſmall one, and intended only to contain a ſlender garriſon.

Ravelins with flanks are not good except when their faces defend too obliquely the glacis, cover'd ways, and the faces of the two baſtions upon the right and left, which frequently hap-

pens in fronts of irregular places, w
curtain is of a length diſproportionab
faces of the baſtions, and one is ob
make the ſaliant angle very open for th
to cover the flanks, their ſhoulders,
curtain.

When a Place may expect a ſtrong
as when the Sovereign is a very
Prince, an Ingineer ſhould make the
both of the outworks and the Place
cious, that the garriſon may have i
power to make retrenchments there
defend the breaches; but if the gar
only be a ſlight one, and conſequent
obſtinately to ſuſtain aſſaults, an Ingine
give the ramparts as little breadth a
to the end that when the garriſon
abandon'd them, and the beſiegers lod
ſelves upon the breach, they may not
cient ſpace there to raiſe batteries.

When any of the baſtions of a Place
be commanded by an eminence in
having ſo fair a view of the faces, as
to make a breach in them from ther
is a neceſſity for covering that baſti
counterguard.

If the two flanks whoſe object is th
of the two faces of a baſtion, ſhould l
to the view of ſome riſing ground i
as to be liable to be batter'd and ru
thence, it is abſolutely neceſſary to p
velin before the point of that baſtio

lar places, when the
isproportionable to the
nd one is obliged to
ry open for the ravelin
eir shoulders, and the

pect a strong garrison,
n is a very powerful
ld make the rampars
nd the Place very spa-
may have it in their
hments there, and to
ut if the garrison can
nd consequently unable
ults, an Ingineer should
ttle breadth as possible,
he garrison shall have
besiegers lodg'd them-
hey may not have suffi-
batteries.
ons of a Place happen to
eminence in the front,
the faces, as to be able
em from thence, there
ng that bastion with a

ole object is the defence
lion, should lie so open
ing ground in the field
attend and ruin'd from
necessary to place a ra-
of that bastion, which
the

the enemy may be necessitated to make themselves masters of, in order there to erect their batteries against the flanks.

When the body of a Place itself is not good, and the whole defence of it depends upon that of the cover'd way; an Ingineer, in the rentring places of arms there, should make lunettes, with revetments and a good grazing fire, annexing all kinds of chicanry and stratagems which may contribute to its better resistance.

Second ditches are absolutely necessary when the situation is very low, and where the requisite quantity of earth is not to be had for giving the works a convenient breadth and elevation.

There are no Places where a second cover'd way sustain'd by lunettes is more proper than such as are accessible on one front only, whose others are cover'd either by the sea, rivers, lakes, morasses, canals, inundations, or by precipices. As these latter cannot be attack'd without the utmost difficulty, the besieged may employ almost their whole garrison in the guard and defence of that second cover'd way, and maintain it resolutely, which is the natural and true defence of those kind of works.

In regard to Places standing on rocky eminences 'tis best following *Blondel*'s advice: "When I meet, says he, with any unevennesses "in their avenues, I rather choose to cut "them down into precipices, than give my"self the trouble of constructing works to for-

' tify them, becauſe ſuch works mig
' enemy as ſo many ſteps or deg
' proach, as ſoon as they had made
' maſters of them.

When any one front of a Fortifi
pens to be a good deal weaker than t
account of its being ſubject to ſome
ments, and whatever advanc'd wo
made to render it equally ſtrong, m
tirely plung'd into from the ſame e
the beſt thing that can be done is
tempt the making any work the
countermine, if poſſible, the whole co
of that front of the fortification: Th
in theſe caſes, where works canno
above ground without great defects,
them underneath, if the depth and na
ſoil will permit.

When places are acceſſible only by
neck of land, of a ſoil eaſily remov
at leaſt fourteen feet above water, co
under the counterſcarp are very go
that avenue is of a rock ſo ſoft as to
termined without much labour, lik
Malta, no work to be made there ca
exceed it, eſpecially as the expence
very great, the avenue being of ſo m
tent; the ſhards of rock flying out
on the ſpringing of the mine muſt grea
the beſiegers; the making a lodgme
ruins be a work of great difficulty, a
leſs labour to attempt to give vent to

h works might ſerve an
ſteps or degrees of ap-
ey had made themſelves

t of a Fortification hap-
weaker than the reſt on
oject to ſome command-
advanc'd works can be
lly ſtrong, muſt be en-
n the ſame eminencies;
n be done is not to at-
y work there, but to
the whole counterſcarp
tification: The beſt rule
works cannot be made
great defects, is to make
depth and nature of the

eſſible only by a narrow
eaſily removeable, and
ove water, countermines
are very good; but if
ck ſo ſoft as to be coun-
ch labour, like that of
made there can poſſibly
s the expence cannot be
e being of ſo narrow ex-
k flying out on all ſides
mine muſt greatly annoy
king a lodgment on the
at difficulty, and an end-
to give vent to the mine;

to

to render it unſerviceable, in hopes to ſecure themſelves from its effects.

Countermines in the ramparts of works are likewiſe excellent when they happen to be on a rock of that kind; and where it is extremely difficult making breach with cannon, the rock running up as high as the cordon; or at leaſt ſo high, that the rubbiſh which may fall from above is not a ſufficient quantity to make the aſcent of the breach practicable.

Redoubts advanc'd beyond the glacis on a ſoil like this, countermined and having a communication with the cover'd way, both above ground and below, are the propereſt works for ſtopping an enemy's advances; he is under an abſolute neceſſity of attacking them under ground, which he cannot do without great difficulty and equal danger; 'tis by works of this kind, thoſe of any place ſhould take in and ſecure the poſſeſſion of ſuch little eminencies as are found beyond the glacis, which might give any advantage to the beſiegers.

There is nothing eaſier than to propoſe and give the dimenſions of works, and even to execute them; but it is evident from all we have been hitherto ſaying, that to apply them properly is a matter of great conſideration, and 'tis this laſt kind of knowledge which conſtitutes an Ingineer: From which we may likewiſe conclude, that no one general ſyſtem, to make uſe of a modiſh phraſe, will ſerve for all kinds of Fortreſſes, even tho' re-

gular ones; that an Ingineer muſt ha
at command, and know how to v
according to the various circumſtanc
places to be fortified: Laſtly, that t
tors of new methods, who have laid th
as general or univerſal ones, have eith
ſincerity or judgment.

CHAP. VIII.

Of Order in the conſtruct

THE conſtruction of Fortreſſ
muſt neceſſarily take abu
time, both on account of the mag
ſolidity of their works, requires grea
conſideration.

M. *Vauban* has very juſtly obſer
'Errors in Fortification are like
'War, whether ariſing from the
'or from dilatoryneſs or expence i
'cution, a fatality ſtill attends the
'in the original deſign ſuch an
'chance to be introduced as may o
'loſs of the Place, ſo any delay
'quences of not having taken bett
'at firſt, or an accidental deficiency i
'or the bad workmanſhip, negligen
'fect of ſome work ill conſtructed ma
'the ſame inconvenience; and any in
'removal of the earth, want of skil

ineer muſt have ſeveral
ow how to vary them
us circumſtances of the
Laſtly, that the inven-
ho have laid them down
ones, have either wanted

P. VIII.

the conſtruction.

n of Fortreſſes, which
y take abundance of
of the magnitude and
requires great previous

y juſtly obſerv'd, 'that
on are like Errors in
g from the plan itſelf,
or expence in the exe-
ll attends them; for as
gn ſuch an error may
ced as may occaſion the
any delay the conſe-
ng taken better meaſures
al deficiency in the funds,
nſhip, negligence, or de-
conſtructed may occaſion
ce; and any inconſiderate
want of skill in maſon-
'ry,

'ry, not underſtanding toiſe-meaſurement, an
'ill-concerted diſpoſition of materials, beſides a
'thouſand other little faults and neglects into
'which one is perpetually falling, never fail to
'ſwell the expence a fourth, a third, ſome-
'times half as much again as the real value
'of the works: Defects the more worthy con-
'ſideration, as the Sovereigns at whoſe expence
'they are committed, always pay ready mo-
'ney and high prices for faults of other folks
'making, yet which none but themſelves can
'repair. To theſe very defects it is owing,
'that the charge of the works ſo conſtantly
'exceeds the eſtimate, and that 'tis ſo hard to
'make them tally, that one may venture to ſay
'it never happens, which tho' it be a matter
'of ſome difficulty is by no means a thing im-
'practicable.'

Conſiderations previouſly neceſſary to the conſtruction of a Fortreſs are,

Firſt, A ſufficient quantity of treaſure in bank to anſwer the great demands of the expence.

Secondly, The Perſons to be employ'd in the execution of the works.

Thirdly, The order to be obſerv'd in conducting them.

We ſhall not enter into any particular detail upon theſe three heads, a whole volume would not ſuffice for that purpoſe: And M. *Vauban* in the Memoirs he has left behind him, has ſaid almoſt all that is to be ſaid upon the ſubject; we ſhall

only ſay juſt as much as is requiſite to ſ
importance of theſe conſiderations, and
cidents which attend the neglect of the

SECTION I.

Of the neceſſary Funds.

OF all the taxes which Sovereigns upon their people, this is the m Whatever they furniſh towards the conſ of a Fortreſs returns to them again, t vance it only to receive it back in th able enjoyment of their effects, whic not be preſerved to them without thei buting to this extraordinary and nece pence of the State.

This tax ſhould be levied before th mencement of the undertaking; to v collecting of the money while the work rying on, would be too tedious and flo ſtoppage or failure in punctual paymen workmen and undertakers would protr conſtruction to a great length, and m bad one at laſt. The beſt workmen w it, the bad only ſtay becauſe not ſure others to find employment elſewhere; fo reaſon a Sovereign ſhould never unde build a Fortreſs till he either hath the m funds in his coffers, or knows where them; and if it is not poſſible for him the whole ready before he begins, h

conſider what he can depend upon furniſhing annually, and take his meaſures accordingly.

If that annual ſum is ſmall, and the work ſuch as would require a very long time to finiſh, it would not be prudent to undertake it; it would be but a fruitleſs labour at laſt, and conſequently money thrown away; for not only the limits and intereſts of State change frequently, and in little time, but the wiſeſt maxims are no longer purſued than while thoſe who have the principal management of affairs find a particular ſatisfaction and intereſt in ſo doing: If a Sovereign falls ſhort in his deſign, his ſucceſſor is generally but ill inclin'd to finiſh works, how important ſoever, the chief glory of which is to redound to his predeceſſor; firſt they neglect them, then diſcontinue them, and when they have been left off for a time, they look upon them at laſt as works of very little neceſſity. How many towns and other works do we ſee left imperfect from no other cauſe, and which yet are of real importance. They never caſt their eyes towards theſe Fortreſſes till they have an immediate and abſolute occaſion for them; and the firſt expences are generally thrown away, becauſe the Ingineer who projected and drew the plan of the deſign being no longer alive, another is to be employ'd: To finiſh ſuch works there is a neceſſity not only for a very able and skilful perſon to divine and unravel the intentions of the former Ingineer, but likewiſe for an honeſt man, who will be content

to

to take up the clue there, and work upon an
deſign, preferring the intereſt of his Sov
who employs him to the dictates of ſel
without both theſe qualities the ſecond In
will neither be able nor willing to ent
the ſpirit and views of him who firſt pr
the deſign, nor even give himſelf the
to examine it; but making it his p
that the way of attack is chang'd from
was formerly, his vanity will put him
ſome project the very reverſe of that
him, without any regard either to t
pence, or time required to put it in
tion. I have even known it propoſed
ſtroy works which have been far advan
conſtruct others leſs expenſive; and
means it comes to paſs that thoſe places
works have been diſcontinued thro' the
of the funds, always coſt infinitely mo
others. What makes ſuch Ingineers ſo h
their propoſals is, that the perſon who
thus run counter to and condemn, can ſ
more; and thoſe who have the autho
decide it have not a ſufficient inſight i
practical part of the art, to weigh the
ments on both ſides. If the ſecond
neer happens not to finiſh entirely w
propoſed, and a third takes it up, the ſam
happens over again, and the fortifica
ſuch a place becomes a jumble of works
one upon another without rhime or reaſ
ſeveral expences of all which works ad

gether amount to a prodigious ſum, infinitely exceeding what it ought to be. Examples might be produced upon this head. 'Tis therefore the intereſt of the whole State that fortreſſes ſhould not be conſtructed at ſeveral times, or by piece-meal; for which purpoſe they ought not to be begun, till there is a ſufficient fund ready to compleat them.

Section II.

Perſons neceſſary for the Execution of the Deſign.

THE neceſſary perſons, for executing the deſign of a fortreſs are,

Firſt, Artificers and workmen in their ſeveral kinds.

Secondly, Ingineers to give them the neceſſary draughts, to trace out the works, to examine the materials they make uſe of, to have an eye to their manner of working them, to meaſure the works, to inform the Miniſter of the preſent condition of them, and to conduct the whole to perfection.

Thirdly, Treaſurers to pay both the one and the other. Surveyors to provide what is wanting, and to decide any differences which may ariſe between the workmen, and the inhabitants of the place and neighbourhood. Above all a Comptroller, to take care to remit the funds

as

as faſt as the works advance, to ſend orders to the Ingineers and Surveyors; to give an account of the whole to the Sovereign, and to receive his commands.

Of the Workmen.

There are two ſorts of workmen made uſe of in fortifications; one for the conſtruction of the Places themſelves, the others for works of attack and defence.

Be the country what it will, you can never want workmen to conſtruct a fortreſs, unleſs it be of ſuch a magnitude, and in ſuch haſte to be finiſh'd, that a very extraordinary number is required; in which caſe 'tis in the power of the Sovereign, giving them a reaſonable price, to oblige not only thoſe of the Place itſelf, but likewiſe the people of the neighbourhood to come and work there. Fortreſſes being built for the ſecurity and defence of the whole State, 'tis for the intereſt of the publick, that ſuch works ſhould have the preference of thoſe intended for the uſe and convenience of particular perſons only. This was the practice of the *Roman* Emperors; but care muſt be taken to pick out ſuch only as are diligent and capable of the work; if diligent, they will not throw away their time; and if capable, they will make no works but ſuch as are good; and thus delay will be avoided of all kinds. With theſe principal workmen you may

join

join the peaſants and ſoldiers, to aſſiſt them in making ſuch works as require neither practice nor experience.

As to thoſe intended to be employ'd in the works of attack and defence, and who are comprehended under the name of Sappers and Minors, they ought to be kept in conſtant pay, as thoſe kind of works require particular practice and experience; beſides you could not otherwiſe be certain to find them when you want them, and it would not be fair to preſs any into that ſervice where the danger is ſo great.

To manage rightly, theſe workmen, or rather ſoldiers, ought to be of the number of Artiſans who either ſerve, or are capable of ſerving in the works of fortification.

Of Ingineers.

The art of fortification is an art which ſtands in need of ſo many others, and whoſe object is ſo extenſive, and its operations accompanied with ſo many various circumſtances, that it is impoſſible for a man to make himſelf maſter of it by experience alone, even ſuppoſing him born with all the advantages of genius and diſpoſition poſſible for the knowledge and practice of that art. We do not pretend to deny that experience is of greater efficacy than all the precepts in the world; but it has likewiſe its inconveniences as well as its advantages; its fruits are of a ſlow growth, and whoever is content with purſuing only

only that method of inſtruction, ſeldom knows how to act upon emergencies of all kinds, before old age incapacitates him from exerciſing his employment. Experience teaches us through the means of thoſe errors we commit ourſelves, what theory teaches us at others expence.

The life of man being ſo ſhort, and opportunities of practice ſo ſeldom happening, 'tis certain nothing leſs then a happy genius, a great ſhare of theory, and intent application join'd to experience, can make him one day ſhine in his profeſſion. From whence it follows, that leſs than the three firſt of thoſe four qualities ſhould not be a recommendation for the reception of a young gentleman into the body of Ingineers.

The fundamental ſciences, and thoſe abſolutely neceſſary, are arithmetick, geometry, mechanicks, hydraulicks, and drawing; without arithmetick it is impoſſible to make a calculation of the toiſement, and to keep account of the diſburſements made or to be made, nor without it can an exact computation be made upon any occaſion whatſoever.

Without geometry there is no ſuch thing as laying down a plan or map with truth and exactneſs, or ſettling a draught of a fortification; or calculating the lines and angles ſo as to make a juſt eſtimation, in order to trace them on the ground, and to meaſure the ſurface and ſolidity of their parts.

Mecha-

Mechanicks teach us the proportions of the machines in uſe, and how to raiſe or lower their powers upon occaſion, and likewiſe to judge whether thoſe which our own imagination ſuggeſts to us will anſwer in the practice. This part of the mathematicks is neceſſary for an Ingineer, not only to prevent his propoſing any thing of that kind himſelf which may be impracticable, but likewiſe to avoid being impoſed on by the fooleries or pretended inventions of quacks, who after copying a machine from a book, will give it you for their own invention; a people, generally ſpeaking, proof againſt ſhame even when detected, and who are under no other concern but how to trick thoſe of their money, who are ſimple enough to credit them.

Hydraulicks teach us how to conduct waters from one place to another, to keep them up to a certain height, or to raiſe them higher upon occaſion.

How fluently ſoever we may expreſs ourſelves either in ſpeaking or writing, we can never give ſo perfect an idea as by a draught; and often in fortification both are wanted; for which reaſon the art of drawing is indiſpenſably neceſſary for Ingineers.

It would likewiſe be proper they had ſome knowledge of the other parts of the mathematicks and of civil architecture; and it were to be wiſhed they knew ſomething of all the reſt of the ſciences. Rhetorick would aſſiſt them to put the narratives they are often obliged to

make

make into a proper method. Grammar teach them to make uſe only of proper terms and expreſſions. Natural Philoſophy enable them to make a judgment on all the different materials, and teach them to penetrate into the cauſes of their good and bad qualities; it would teach them likewiſe to diſcover the qualities of the air, whether wholeſome or dangerous, and the different properties of water, without which it is not poſſible for them to judge whether a fortreſs will be a healthy habitation. Hiſtory would furniſh them with examples to confirm the propoſitions they advance, and to defeat thoſe which in their judgment ought to be refuted. Thoſe who have not applied themſelves to the ſciences, without doubt will ſay we require too much of our Ingineer; that the underſtanding and memory of one man is not capable of ſo many different kinds of knowledge; but when they ſhall have been inform'd, that all theſe ſciences have a chain or connexion among themſelves, that there are ſome things which are common to them all, and that one giving light to, is an introduction to the eaſier learning of another, they will ſurely allow the thing to be poſſible, the rather as we do not require that an Ingineer ſhould excel in every one of thoſe ſciences. We only deſire that he ſhould not be entirely ignorant of them, otherwiſe what we propoſe would be impracticable: For if as *Vitruvius* ſays, it is a difficult matter to find in every age a perſon excellent in any one profeſſion, how

is

is it to be expected that an Ingineer ſhould be maſter of all thoſe accompliſhments, any one of which is with ſo much difficulty acquired.

It is a law wiſely ordain'd, to admit none as Ingineers who have not been firſt examin'd in thoſe Sciences that are abſolutely neceſſary. Marſhal *Vauban* was of this way of thinking: * 'Thoſe young Gentlemen, ſays he, who would 'introduce themſelves to be employ'd as Ingi- 'neers in the Fortifications, ſhould be examin'd 'publickly, and oftener than once, not only in 'what relates to Arithmetick, Geometry, and 'Drawing, but likewiſe in all the other moſt 'neceſſary branches of the Mathematicks. 'After which I ſhould be for obliging them to 'paſs a year or two of probation in Places 'where there are large works, to ſee the ex- 'tent of their genius and application, and what 'progreſs they make; and when that time 'ſhall be expired, and they have been exa- 'min'd over again both in the theory and prac- 'tice, they may then be received into the rank 'of † Seconds: But if after having paſs'd thro' 'their Noviciat, they ſhall appear not fit for 'the purpoſe, they may be withdrawn from 'thence, and have ſome employment given 'them in the Infantry, where what they have 'learnt will be of great ſervice to them.'

That ſecond examination in theory and practice propoſed by the Marſhal, cannot but pro-

* *Le Directeur des Fortifications.*

† *Or Practitioners.*

duce good effects; it will engage them to perſevere in their ſtudies and application; by this means will be known the real diſpoſition of each towards the buſineſs, and thoſe may be got rid off, from whom no good is to be expected.

The Marſhal's ſentiments on the choice of chief Ingineers are no leſs judicious, 'it is never proper, ſays he, to give the chief direction to young Ingineers, who have not ſerv'd a ſufficient time under ſuch of the firſt rank as are men of capacity, and thoroughly vers'd in the buſineſs, nor to charge them with a very heavy work at firſt, but to inlarge their task by degrees, till they grow perfectly well ſettled and confirmed; the rather, as the moſt experienc'd find it difficult enough to acquit themſelves tolerably of their charge; betwixt the variety of the works themſelves, and the different ways of conducting, the moſt skilfull often find themſelves at a ſtand.'

In another place he ſays, 'tis a charge requiring infinite care, conſtant activity, great good conduct, good ſenſe, and experience in Earth-works, Timber-works, and Maſonry, with a perfect knowledge in all the ſeveral kinds of materials and their prices, and the different capacities of workmen: Qualities all ſo neceſſary in the conducting large works, that wherever they happen to be deficient, one may aſſure one's ſelf the leaſt ill conſe-

'quence

quence that can enſue will be delay, a tedious and wearyſome conſtruction, a number of ill-made works, and always abundance of ſuperfluous expence; accidents all unavoidable, where the perſons charged with the conducting the work are men of but a midling capacity.

As the chief Ingineers ought to be choſen out of the moſt knowing, the moſt diligent, and moſt experienc'd of the Subalterns, in like manner the Directors ought to be choſen out of the chief Ingineers.

To acquit himſelf well of that duty, he ſhould underſtand perfectly well theſe ſeven principal parts of it.

Firſt, The purpoſes for which particular Places are fortified; that is to ſay, the circumſtances which render thoſe Places of importance to the State.

Secondly, What Situations are proper to be fortified, with their good and ill qualities.

Thirdly, The different forms which Fortreſſes are capable of; that is to ſay, the ſeveral methods of Fortification.

Fourthly, The quality of the ſeveral ſorts of materials made uſe of in the execution of the deſign, and the particular method of working them, in order to make good works.

Fifthly, All the various ways by which a Place is to be attack'd.

Sixthly, The manner of guarding, maintainining and defending a Place againſt attacks of all kinds whatſoever.

Seventhly, How to ſtore a Fortreſs; that is to ſay, to furniſh it with the quantity of men, proviſions and ammunition neceſſary for its defence.

Theſe are the ſeven fundamentals or baſes on which Fortification is grounded and eſtabliſh'd; without the knowledge of which it is impoſſible for any one to execute the office of a Director, without committing an infinity of errors, to the prejudice of the State and Sovereign. Marſhal *Vauban* ſays, that Employ ſuppoſes an Officer of great experience, very knowing in the art of war, and always one of the moſt ancient Ingineers.

The offices of an Ingineer in the Town and in the Field are very different. A man may be qualify'd for the one and not for the other. Without entering into a particular detail of their difference we ſhall ſay after M. *Vauban*, that the neceſſary qualifications for a Field-Ingineer are ſkill, courage, great quickneſs, accompanied with a ſolid judgment; without theſe qualities they can never be uſeful in their ſtations: If they have but little ſkill, they commit an infinity of 'faults through incapacity of acting better; 'if their hearts are not good, the greatneſs of 'the danger will aſtoniſh them, and diſorder 'their ſenſes when they have moſt occaſion 'for their aſſiſtance; and tho' at other times 'they may be men of the greateſt abilities,

* *Memoires ſur le conduite des Sieges.*

'not poſſeſſing themſelves at that juncture, they are capable of nothing. If they want quickneſs and judgment they will not be able to find expedients upon extraordinary occaſions, nor to prevent or remedy inconveniences which may happen: 'Beſides theſe 'qualifications abovemention'd, that profeſſion 'requires a conſtant application and conſummate experience in the principal parts of war. 'Now if we ſo ſeldom ſee great courage, 'wit and judgment united in the ſame perſon, it would be ſtill more extraordinary 'to ſee that perſon eſcape the violence of our 'ſieges, and ſurvive long enough to acquire the 'other two qualifications: This being ſuppoſed, 'we ought not to wonder if amongſt ſo many 'who imagine themſelves Ingineers, and call 'themſelves ſo, we find ſo few able men, and 'who really are ſuch. The profeſſion is grand 'and noble, but it requires a peculiar genius 'and a conſtant application for many years, 'with which the hard duty and perils of our 'ſieges but rarely agree.

To the qualities abovemention'd muſt be added activity and vigilance, both which are abſolutely neceſſary in all operations of war, but eſpecially in the attack of ſuch places as are in expectation of ſuccours. The beſieged muſt have no time allowed them for conſideration, one hour loſt at ſuch a juncture is two at leaſt; nay the loſs of a minute may be irreparable. 'Tis by 'their activity and vigilance that

Ingineers often bring the beſieged to capitulate abundantly ſooner than they would have done if thoſe Ingineers had not with ſuch haſt puſh'd on the attack. Want of vigilance and activity often proceed from irreſolution, and that from weakneſs of capacity.

The inſufficiency of a chief Ingineer may either be the occaſion of a town's not being taken when attack'd, or of that being taken in which himſelf is beſieged; the truth of this art conſiſts in knowing how to overcome all obſtacles he meets with in an attack, and to throw new ones in the way of the beſiegers, in the defence of the ſmalleſt places.

It would be needleſs to expatiate upon the neceſſary qualifications of Treaſurers and * Intendants, we ſhall only repeat what M. *Vauban* ſays as to the choice of the latter: 'it is extremely proper that the Intendants of the 'Fortifications ſhould likewiſe be ſo of the † *Police*, of *Juſtice*, and of the *Finances*; becauſe 'the uniting thoſe offices gives them authority, credit, and the means of providing for the 'many preſſing occaſions which frequently 'happen in works of this kind; where the 'delay might be prejudicial if what was wanting could not be furniſh'd in the Country, 'without being obliged to expect orders from 'Court.

* *Surveyors.*

† *Officers in the* French *Civil Eſtabliſhment.*

'The Fortifications of Places, ſays the Mar-
'ſhal again, being Royal Works, built for the
'defence of the States, 'tis indiſputable that the
'firſt officers who ſhould have inſpection over
'them, are the Sovereigns of the towns them-
'ſelves, being the Perſons moſt intereſted, as
'as well as their principal officers.

The perſon to whom is entruſted the care of the Fortifications of a State ſhould be a man of great abilities, with a competent skill in that art over which he preſides, to enable him to judge of the merits of the ſeveral members of that body, to employ each according to his particular talent, and to do juſtice to all in the diſtribution of his Sovereign's favours.

Of the Appointments of Ingineers.

As the office of an Ingineer requires great natural qualifications both of knowledge, ſtudy, and application, it is but reaſonable that the pay ſhould be proportion'd to that merit which is to be the qualification of the perſon employ'd; he muſt be at an expence for books and inſtruments for his inſtruction, as well as for many other things; and that he may be at liberty to purſue his ſtudies with application muſt not be put to ſhifts for neceſſaries: It ſhould likewiſe be conſider'd, that if an Ingineer doth his duty, be his ſtation what it will, his fatigue muſt be very great, and to dedicate himſelf wholly to

that duty, he ſhould be diveſted of all other cares.

It were likewiſe but reaſonable that Ingineers would have ſome extraordinary appointments when they are to be employ'd in enlarging the Fortifications of a Place, or in rebuilding or repairing ſuch works as require a more than ordinary care and exactneſs. Something of this kind, as I am told, is the practice in *Spain*, where Ingineers have an allowance of ſo much in the pound out of all monies expended on the King's account. In *France* the King ſometimes makes them gratifications, or raiſes their ſalary when their work is done; but preſent rewards are more effectual than thoſe in expectancy only, which do not always fall to their ſhare who bore the burthen of the labour.

Of ſubordinary Diſcipline.

Of the Subdiviſion of Perſons employ'd in the Fortifications.

Diſcipline is a part moſt abſolutely neceſſary, both to be eſtabliſh'd, and obſerv'd, throughout all the military branches of a State.

The firſt part of this diſcipline conſiſts in the diviſion of one corps into ſeveral, and the ſubdiviſion of the latter into others ſtill leſs; without this, it would be impoſſible in ſo great a number of workmen to avoid diſorder and confuſion, the uſual cauſe of dilatorineſs in works.

In the conſtruction of Places, that corps of workmen is divided into ſeveral others, who are called bands; the firſt of whom is called the foreman, and who is to have an eye over the reſt in carrying on the work: We ſhall not enlarge upon this article, the practice is ſufficiently known.

The band of workmen call'd Sappers and Miners, entertain'd chiefly to ſerve at the attack and defence of Places, ſhould be divided into as many other companies as the State has frontiers like to be viſited by the war; each of theſe companies again ſhould be divided into ſeveral leſſer ones; that done, it will be eaſy upon occaſion either to ſeparate them, or to draw ſeveral of them together in thoſe parts wherever the ſtreſs of the war ſhall happen to be, and where a great number may be wanted for the attack of Places.

The officers of each of thoſe companies ſhould be Ingineers, and as it is a leading circumſtance to the ſucceſs of any action that the ſoldiers and their officers ſhould be acquainted with each other before-hand, and 'tis from the Ingineers that the former are to receive orders for the works of attack, defence, and conſtruction of Places, 'tis evident the latter ought to be charg'd with the conduct and command of them; to give it to others were a ſuperfluous expence abſolutely unneceſſary, and even to the prejudice of the ſervice; for obedience to a temporary command, and that like to be but of a ſhort duration,

tion, is never ſo entire, ſo ready, and ſo exact as when paid to him from whoſe command we can by no means eſcape. Ingineers are the natural officers of workmen, ancient and conſtant uſage has confirm'd the practice.

If it be objected that the care and management of a company is a buſineſs which would break in upon the ſtudies of an Ingineer, and divert his application, it may be anſwer'd, that a company of workmen is not like a company of ſoldiers; the better pay of the former, and profits of their work makes their condition ſo eaſy, that they can furniſh themſelves with whatever they want without the inſpection of an officer, and fall more readily to their duty.

'Tis from amongſt theſe Ingineers or corps of officers of the workmen, according to their age and capacity, that as many as are wanted are taken, to look after the keeping up of the works in Places, or after the repairing and rebuilding them, in the ſame manner as Town-majors are taken out of the corps of Infantry; and in the working time and ſeaſon, the corps of workmen on any part of the frontier, may be diſtributed and ſet to work upon any of the places in that neighbourhood, proportioning their numbers to the buſineſs, and that work done, rejoin their companies. The ſoldiers and officers may likewiſe be employ'd there, the firſt as workmen, the latter as Ingineers, all under the command of the Ingineer in chief and the Director, in the ſame manner as the officers and

ſoldiers

ſoldiers of a garriſon are under the command of majors of the Place. In like manner as the canoniers and bombardiers have always the officers of the artillery to command them, agreeable to the King's order for eſtabliſhing uniformity of ſervice throughout the army.

Some are of opinion, that the two corps of Ingineers and of Artillery ought to be united; and there is this to be ſaid for it, that Ingineers ought to underſtand ſomething of Artillery, and Artillery-Officers ſhould have ſome knowledge of Fortification, for both to acquit themſelves well in their employments. But by uniting both into one corps, the knowledge of each man's duty would become ſo diffuſed, that you could expect only men of ordinary abilities in either profeſſion; for the more the object of our reſearches is limited and confined, the eaſier it is fathom'd by thoſe who apply themſelves; whereas vaſt objects require vaſt geniuſes to comprehend them, and ſuch ſpirits are rare.

If Teachers were appointed to each of theſe principal corps, as is practiſed at preſent in the regiments of artillery, ſuch a number of hopeful youth might be form'd as would be a great benefit to the ſervice; for in a large number a good choice is much eaſier made than in a ſmall one. All the world knows, enough are born with diſpoſitions and inclinations for the moſt uſeful and neceſſary arts and ſciences; but many wiſe men have remark'd, that the greateſt part of thoſe advantageous talents

are

are loſt to the State, for want of the poſſeſſor's having means or opportunity to cultivate them.

To avoid all diſputes and difficulties amongſt officers of the ſame corps, it is neceſſary, at the time of their eſtabliſhment, to enter into a detail of their ſeveral employments, and to make a regulation accordingly, that every one may know what belongs to his department, and how far his functions extend. But as 'tis our intention to be brief, we ſhall ſay no more on this head.

Of Exerciſe.

'Tis by exerciſe that the workman learns his buſineſs, and by long practice that he becomes expert in it.

As all workmen employ'd in buildings of any kind, may ſerve very well for works of fortification, it is certain excellent hands may be pick'd out from amongſt them, without being at the trouble of training them up one ſelf: But as to thoſe intended for works of attack and defence, the caſe is not the ſame. Such artificers as terraſs-makers, maſons, ſtone-cutters, quarry-men, carpenters, cart-wrights, ſmiths, *&c.* are the propereſt perſons, but with this skill of their's to make them capable of good ſervice, both exerciſe and practice will be required. Of theſe two means the firſt is the beſt; if the ſecond only is uſed, the practitioner can never become

expert

expert till after the commiſſion of many faults, and all at the expence of the Prince's ſervice.

Theſe workmen are properly ſpeaking ſoldiers, or rather both one and t'other; their buſineſs being either fighting or working, as occaſion requires: The firſt exerciſe to be taught them is the uſe of their arms, the next thing is to keep them to their buſineſs, not only to make them more capable of it, but to accuſtom them to labour and fatigue, to enable them the better to endure thoſe of a ſiege, which are very great. This is eaſily to be done; 'tis only ſetting them to work preferably to others on new conſtructions, rebuildings and repairs, and keeping up the works of a place. The third kind of exerciſe is the inſtructing them in the ſeveral forms, dimenſions and properties of works to be made at ſieges; to which purpoſe during peace, ſome fictitious ſiege ſhould be carried on from time to time, where all thoſe works ſhould be made, which are to be met with in attacks or defences: This laſt exerciſe will not only be of ſervice to the new but to the old workmen likewiſe, and even to the officers themſelves. Theſe kind of fictitious actions frequently give riſe to reflexions, as inſtructive as any which are made at the real actions themſelves. By this means you may have good miners and ſappers in abundance, who in time of ſieges may eaſe the Ingineers, and even ſupply the want of them upon occaſion.

Of

Of Behaviour.

Notwithſtanding the irregular behaviour and looſe morals ordinarily found amongſt military men, and which ſhould ſeem no very favourable preſage of what may be expected from them, when their Sovereign's glory, and their country's intereſt demands their ſervice: Nevertheleſs wiſe and judicious men have maintain'd, that good morals are as indiſpenſably neceſſary in men of their calling, as in thoſe of the moſt exemplary profeſſion; but ſuppoſing ſome freedoms of this kind to be overlook'd in the officers of the foot and horſe, the caſe is not the ſame in regard to Ingineers. The vaſt extenſiveneſs of their profeſſion, the many different kinds of knowledge required of them, and the conſtant ſtudy and application in which they ought neceſſarily to be engaged, if they would render themſelves capable of their duty, require a calm mind wholly bent upon its buſineſs. We ſhall ſay nothing of obedience, ſubordination or fidelity, being qualities all abſolutely eſſential to military men, to whatſoever corps they belong.

Of Puniſhment and Reward.

Puniſhment and reward, according to all politicians, are the two reins of government, of which whoever underſtands the management, may

may direct thoſe under his authority juſt as he pleaſeth; to this purpoſe, both are abſolutely neceſſary: One without the other never doth well. In countries where offences againſt the publick intereſt are ſeverely puniſh'd, every one endeavours of his own accord to render himſelf worthy of an employment before he ſollicits one.

If it is of conſequence not to ſuffer offences to paſs unpuniſh'd, it is no leſs ſo, that merit ſhould not go without its reward. 'States *, 'ſays Cardinal *Richlieu*, are never in a worſe 'way, then when the Miniſter's affection for 'his particular favorites, prevails over their ſer-'vices who are more uſeful to the publick. 'When that is the caſe, neither our publick 'ſpirit, nor the hopes of reward, are any longer 'excitements to virtuous actions; on the 'contrary, we remain in a ſtate of indifference 'betwixt good and evil, till either thro' envy, 'jealouſy or vexation, all are born away from the 'purſuit of their duty, none expecting ever to 'find themſelves the better for doing it.' Whereas it is certain, that by well rewarding thoſe who excel in uſeful and neceſſary arts, you are ſure of having thoſe arts carried to their utmoſt perfection; for men of the greateſt talents and abilities never fail dedicating themſelves to thoſe profeſſions, to which are annexed the greateſt rewards. The author of *Telemachus* is of this

* *Political Will.*

ſentiment,

ſentiment, 'That earneſtneſs, ſays he, which 'you employ in ſearch of men of ingenuity 'and virtue, to promote them; excites and 'encourages all who have either capacity or 'ſpirit; every one doth his utmoſt. How many, 'ſays he, of thoſe, who languiſh at preſent in 'indolence and obſcurity, might yet become 'great men, if emulation and hopes of ſucceſs 'but awaken'd their induſtry.'

SECTION III.

Of the Regulation and Conduct to be obſerv'd in the Execution of Works of Fortification.

IF it were to be left to the Ingineers themſelves to preſcribe ſuch a rule of conduct as they thought proper to be obſerv'd in the execution of works of fortification, there would be as many different methods of carrying on the works, as there are fortreſſes in the State, to the great trouble, fatigue, and embaraſſment of the treaſurers, ſurveyors, comptroller, and even of the ſubaltern Ingineers themſelves, who are ſhifted from one place to another. Beſides this licentiouſneſs in the choice of a method, might give an opening to infinite abuſe. It is therefore for the advantage of all perſons employ'd in works of fortification, as well as for the

the intereſt of the State, that one uniform rule of conduct be eſtabliſh'd and obſerv'd in all places where works are carried on, for the inſtruction and guidance of thoſe who are charg'd with them: Which regulation ought to contain theſe articles following;

1. To determine and fix the kind of meaſure to be uſed in laying down plans and maps, and likewiſe in the toiſing. To ſettle the ſcales of thoſe plans and maps, and the manner of drawing them; without theſe precautions, things might be taken in a different ſenſe from that in which they were intended, and create miſunderſtandings, wrong judgments, and falſe concluſions.

2. To make it a law, that no Ingineer ſhould ſettle the plan of the Fortification without firſt making an actual ſurvey of the ſpot where it is to ſtand, and of the country round about it, within cannon-ſhot of the place, where all the particulars of the ground are to be taken notice of. Without ſuch a ſurvey one can never adjuſt properly the plan of the Fortification, take all advantages of the ſituation, correct the defects of it, and avoid all unneceſſary expences; nor can the deſign itſelf be otherwiſe than very imperfectly traced. This rule ought not only to be obſerv'd with regard to new places, but likewiſe when the old are to be enlarg'd, or any part of them to be rebuilt.

3. To allow an Ingineer ſufficient time to ſettle his draughts, and to oblige him, 1. To make ſeveral of the ſame Fortreſs, and of each work in particular, for one deſign is never ſo excellent but another may be propoſed very near as good, and the art of Fortification is not ſo barren, but it can furniſh ſeveral means to arrive at the ſame end, to wit a long defence. 2. To examine and make remarks upon the ſeveral properties of each plan, their difference, and their different expences, that the Prince or his Miniſter may compare them, and determine upon which he thinks beſt and moſt ſuitable to the ſtate of his affairs. The impoſing ſuch an obligation upon an Ingineer cannot but be extreamly for the intereſt of his Sovereign; the firſt thoughts are not always the beſt, 'tis the part of the imagination to bring forth a number of them, and that of the judgment to examine them, and to make the choice.

When Ingineers are obliged to give one ſingle deſign only of the works they propoſe, if that deſign unluckily happens not to be the beſt the ſubject is capable of, altho' you make it apparent by never ſo good reaſons, they do not ceaſe to defend it with ever the leſs heat and obſtinacy, from a principle of ſelf-conceit, the common frailty of mankind. Whereas when ſeveral different ones are required at the ſame time, the preference given to any one of them doth not hurt that vanity.

An Ingineer who is deſirous of ſerving his Prince as he ought, after ſettling his deſigns, will re-examine them with all the circumſpection poſſible, and then correct them. To do this effectually, he muſt go upon the ſpot with the plan in his hand, there to examine ſuch circumſtances as the plan itſelf can but imperfectly repreſent; to ſee whether he has made uſe of all advantages in the ſituation, and ſupplied the defects of it, avoiding places that might be prejudicial to the defence, or oppoſing them with larger works, more ſubſtantial, and either more in number, or capable of greater reſiſtance: And whether he has managed the expence with frugality, without failing in any thing eſſential. This is not to be done without trouble, but the expence a Prince muſt neceſſarily be at to fortify a place, makes it highly reaſonable that an Ingineer ſhould ſet apart ſo much time, to correct his own deſign, and compare it upon the ſpot, eſpecially having generally ſufficient leiſure ſo to do. They who deſpiſing this maxim have aſſumed a merit to themſelves, for having finiſh'd their deſigns in a very ſhort time, have only made it manifeſt, tho' too late, that they have been miſtaken. For there are few places but have ſomething or other amiſs, and to be rectified, were their works to be begun again.

4. To oblige an Ingineer when order'd to lay out the deſign of a new Fortreſs, to calculate the lines and angles of his plan, profils, &c. This is abſolutely neceſſary, 1. In order to

know exactly the ſolidity of the works to be rais'd, and the contents of the excavations, and whether the latter will be ſufficient, or too great a quantity for the works which are to be rais'd. 2. To give the Prince as juſt an eſtimate as can be made of the expence of the Fortification. 3. To trace the plan of the Fortification upon the ground, with all the exactneſs that is poſſible; becauſe when the deſign is but a ſmall one, if you only take the extent of the lines upon a ſcale, and the value of the angles upon a ſemicircle, there will always be a miſtake of ſome toiſes or degrees; and thus the work becomes not altogether conformable to the deſign. The only means of avoiding this fault is to compute by trigonometry the extent of all the lines and angles.

5. To oblige the Ingineers to make as juſt an eſtimate as poſſible of the expences of the whole Fortification. This eſtimate muſt depend upon the quality of the materials intended to be uſed in the works, the places from whence they are to be fetch'd, the money they coſt on the ſpot, the expence of their carriage, that of their faſhioning, of ſetting or working them; dribling charges to forward that carriage, faſhioning, &c. charge of making new ways, repairing of old ones, cutting canals for water-carriage, conſtructing neceſſary machines; all theſe expences muſt be taken in, to make a valuation of each piece of work at ſo much a toiſe.

It is of great conſequence, that this eſtimate ſhould be juſt. If overcharg'd, it might occaſion the unſeaſonable rejecting of a plan on account of its expence only, which might otherwiſe be very advantageous to the Sovereign's affairs; and if the charge is under-rated, it may occaſion the Prince's engaging in a work, whoſe expence exceeding his finances, it may perhaps on that account be impoſſible to finiſh, within the time when it is moſt wanted. Eſtimates are never allow'd either to exceed or fall ſhort of the real expence above a ſixth part at fartheſt, if they vary farther, 'tis either his fault, who projected the deſign, or his who had the execution of it; but when the ſame perſon has the charge of both, the difference ought to be ſtill much leſs.

6. To oblige the Ingineers, after ſettling their plan and making their eſtimate, to draw up an orderly and explanatory account of their deſign, by which the Sovereign, or Miniſter who has the charge of the Fortifications, may be enabled to form a judgment of what is propoſed.

This ſcheme of the Ingineers to be properly drawn up, if the place is a new one, ſhould begin with ſetting forth clearly and evidently the importance of the new Fortreſs propoſed, the advantages and diſadvantages of the ſituation; then giving an account of the deſign itſelf, point out the good and bad properties of the works which compoſe it, with his own reaſons for making them what they are.

* 'If the buſineſs is either to improve ſome 'place already fortified, or to make an addition 'to it of ſome conſiderable work, it ought fairly 'to repreſent the condition of it, ſetting forth its 'good or bad properties, and the neceſſity of 'remedying the latter, propoſing afterwards 'what method he thinks proper for improving 'the good and amending the bad ones. The 'ſame thing ſhould be done when the works of 'a place are either to be rebuilt or repair'd.

'After this he ſhould deſcribe the ſeveral parts 'of the conſtruction, piece by piece, in intelli-'gible terms, making uſe of cyphers or the 'letters of the alphabet, to mark the ſeveral re-'ferences to the plans, profils, and particular 'figures made in them, in order to facilitate 'the underſtanding of his propoſition.

'Laſtly, it is neceſſary he ſubjoin a ſhort eſti-'mate of the charge of the ſeveral works he 'propoſes, in which he is to come as near the 'truth as poſſible. From this he is to draw 'out another, ſetting forth in ſo many ſeparate 'articles, the works propoſed to be made 'each year, allotting the firſt entirely to the 'making preparations, if 'tis any thing of a 'great deſign; the ſecond, to the conſtructing 'the works of greateſt importance; the third, 'to thoſe which are next in degree, and ſo of 'the reſt, beginning always with thoſe which 'may ſooneſt put the place in a ſtate of de-'fence.

* M. *Vauban.*

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'The charge of each work is conſtantly to 'be ſet down at the end of that article, and the 'ſum total of all thoſe propoſed to be done in 'the year at the bottom of that diviſion.

'By this means the Miniſter, who has the 'charge of the Fortifications, will be enabled to 'form a perfect idea of the deſign, and with 'much greater eaſe to himſelf, fall into the 'neceſſary meaſures for putting it in execution.

'After this, if he has any thing particular 'to recommend in the Fortifications he pro-'poſes, he ſhould deſcribe its properties in a 'ſhort note at the end of his eſtimate, which 'is to have a reference to the plan for better 'explanation. It will be extremely proper to 'be as particular as poſſible, and to enlarge as 'much upon each article, as this will explain 'the uſes they are capable of in a ſiege, and 'perhaps manifeſt ſuch properties to thoſe who 'are to have the defence of them, as they 'might otherwiſe never have diſcover'd.

'When he has finiſh'd his project, and with 'it the explanatory notes according to order, 'he muſt ſend them with the plan and memo-'randums to the Miniſter or Secretary of State, 'who has the department of Fortification in 'order for his Majeſty's approbation.

'It ought to be a conſtant rule, never to 'enter into any expence, nor to begin any 'work propoſed by a Director, till the Mini-'ſter's anſwer has been receiv'd in regard to 'the approbation or alteration of the deſign.

7. That no project be ever order'd to be put in execution, till it has firſt been examin'd with all the care and attention that is poſſible, by a conſultation of able Ingineers, where the author is to be preſent, and likewiſe the perſon who is to put it in execution. The affair is of too great importance to be left entirely to the deciſion of a ſingle perſon, and many heads, ſays the proverb, are better than one. Such an aſſembly would ſcarce break up without warm debates; but thoſe kind of diſputes generally give riſe to ſuch explanations as are extremely for the benefit of the ſervice, and which cannot fail inſtructing both the perſons who propoſed, and them who are to execute the deſign.

8. After the project and draughts have been examin'd, to ſettle the liſt of ſuch works as ſhall be judg'd proper to be finiſh'd within the compaſs of each year, and eſpecially of the firſt.

9, To oblige the Director, who projected the deſign, to make out a *Devis*, that is to ſay, an explanation of the particular parts, the meaſures to be taken, and conduct to be obſerv'd in the execution of them.

* 'This *Devis*, or Explanation, muſt be ſim-'ple, clear, neat, and diſtinct, expreſs'd in the 'proper terms of art, and in the dialect of 'the country, that the workmen may all 'perfectly underſtand it. It muſt contain no

* M. *Vauban.*

'equivocal

'equivocal expreſſion, or ſuch as is capable of 'two interpretations; and for this purpoſe, 'before the work is begun, the Ingineer ſhould 'be perfectly well acquainted with the nature 'of the ſoil intended to be built on, the quality 'of the materials to be uſed; and always have 'a plan of the work, a draught of the elevation, 'and as many profils as there are different levels 'of the ground, all of them accurately drawn, 'with the ſtricteſt regard to meaſurement; 'the changeable appearances of the ground na-'turally repreſented, and a ſcale at the bottom 'exactly divided; as thoſe draughts or figures 'annexed to the *Devis*, will better explain what 'they repreſent than the beſt written diſcourſe 'in the world.

'Theſe plans, drawings, and profils are to be 'annex'd to the *Devis*, which is to have its re-'ferences mark'd with cyphers and letters of the 'alphabet, to make the thing more intelligible.'

10. Always to ſet the works out to undertakers when it is poſſible to be done. 'Works 'of Fortification, ſays M. *Vauban*, are uſually 'done either by general or particular contract 'or piece-work, or by a * duty impoſed on 'the country call'd *Corvèe*, and ſometimes 'after a mixt manner conſiſting of all theſe 'ways.

'When contractors are to be met with upon 'reaſonable terms, men of ſubſtance and of

* *Ouvrage a Corvée; a work impoſed on the Peaſants, for which they are not paid.*

capacity

'capacity to engage for the whole, it will be 'beſt to treat with ſuch, explaining clearly all 'the particulars in the Devis of the ſeveral 'pieces contain'd in it; but it is a very rare 'thing to meet with heads ſtrong enough to 'bear ſo heavy a burthen as a general under-'taking of this kind, the hurry in which the 'works are generally puſh'd on, occaſions at 'long run numberleſs contraventions of the arti-'cles, till the affair at laſt becomes ſo embroil'd, 'and the undertaker ſo often confounded as not 'to know where abouts he is.' Tis beſt limiting 'the agreement to ſome particular works, and 'ſuch as may be accompliſh'd in a little time; 'but whatever way you proceed, every thing 'that is done ſhould be meaſured within the 'year, and the account made up with the con-'tractors.

'All ſmall piece-work, and working by the 'day, ſhould likewiſe be avoided, as intro-'ducing only tricks and confuſion; beſides in 'that caſe the workman knowing the utmoſt he 'can earn, is never in a hurry to make an end, 'whereas he who is paid as he goes on, wants 'no overſeer to puſh him forwards but his 'own intereſt.

'*Corvée*, or peaſant-work ſhould never be 'impoſed where the works are ſuch as require 'either neatneſs or expedition; for skill and 'diligence are not to be expected from people 'who never work but when they are forc'd to 'it, and then only want to get the time off

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'their hands; but when one is obliged to make 'uſe of them for the removing of ground, ſuch 'a quantity ſhould be enjoined them as a task, 'diſtributing it amongſt them by companies, 'having an eye to their treatment of one an- 'other, or to any agreement they ſhall come 'to with the undertakers to make an end of 'the buſineſs; which ever way they do, to 'take cogniſance of it, and charitably to take 'care that thoſe with whom they treat neither 'over-reach them in their price or meaſure, 'nor ſell their labour too dear.

'To act rightly, this peaſant-work ſhould 'never be exacted unleſs for carriage of ma- 'terials, or for making works of a very coarſe 'kind, and always as ſparingly as poſſible, in 'regard to the ruin it brings upon the country.'

11. To ſettle the forms to be obſerv'd in the Award and Contract, and the firſt rule in regard to both when it is for a new place, and the works conſiderable, is, that they be done in the preſence of the Miniſter of the Fortifications; or before the Surveyor or his Subſtitute, when the buſineſs is only the improving, rebuilding, repairing, or keeping up of an old one; the ſecond is, that the Ingineer who drew the plan, he who is to be charg'd with the execution of it, and the Town-Major of the place be likewiſe preſent. This is the judgment of M. *Vauban*. Nothing ſhould be 'concluded in regard to the contract, whether 'the work is put up to abatement, according

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'to the uſual method, or diſpoſed of any other 'way, without the Governor, King's Lieute-'nant, and Majors of the Place being call'd, 'and ſigning the act as done in their preſence; 'the Mayors and Sheriffs ſhould be there like-'wiſe, to make the whole authentick. The 'third rule is, that the contract be always 'awarded to the laſt and loweſt bidder, pro-'vided the perſon be a man of capacity, and 'of reſponſible circumſtances.' M. *Vauban* makes a very important remark upon this ſub-ject: 'When the buſineſs, ſays he, is to re-'ceive propoſals from undertakers concerning 'any conſiderable works, 'tis beſt doing it in 'form, but not always letting them to thoſe 'who are willing to undertake them upon 'the loweſt terms; it will be neceſſary to exa-'mine not only whether they are men of 'ſubſtance, to be reſponſible for the monies im-'preſs'd into their hands, but whether they are 'capable of performing what they are ſo ready 'to undertake; and then, if it ſhall be thought 'proper to cloſe with them, to do it upon rea-'ſonable terms, without beating down the 'price too low; becauſe if it be any thing of 'a large concern, and offer'd to poor ignorant 'people, they will be ready to undertake it 'upon any terms, in hopes of getting a penny 'out of it ſome way or other, or at the worſt, 'ſubſiſting at the expence of the undertaking: 'But, inſtead of depending upon ſuch, when it 'comes to the execution, all you have to expect

'from

'from them is, that they will endeavour to
'make the moſt of their bargain, and put all
'the works in confuſion; after which, their
'heads turning, they either ſink under the bur-
'then, or run away if not prevented, which
'they will infallibly be obliged to do at laſt,
'but which never happens without occaſion-
'ing a great augmentation of the expence,
'intolerable delays, vaſt confuſion, and a
'general diſcredit thrown upon the works;
'the conſequence of which is, thoſe which
'might have been made for 30 ſols the toiſe,
'generally coſt 40 or 50; thoſe which ſhould
'have been finiſh'd in one year are not finiſh'd
'in two; and the diſorder they are thrown
'into gives infinite trouble to thoſe who have
'the conduct of them, till at laſt the workmen
'deſert for want of being paid, and give the
'works ſo bad a name that none will offer to be
'employ'd in them. From all which we may
'be aſſured, that nothing is ſo pernicious as
'thoſe pretended good bargains, which ſhould
'be regarded in no other light than as the ef-
'fectual means of drawing out the work to
'an endleſs length, without any proſpect of
'ever ſeeing it finiſh'd. The intention of all
'this, is only to ſet thoſe people to rights,
'all whoſe concern is to endeavour to beat down
'the price of the works as low as poſſible, in
'order to get a cheap bargain, without conſider-
'ing the conſequences, or whether it be poſſi-

ble,

'ble for the contractors to perform their agree-
'ment.'

The fourth point of form to be obſerv'd in regard to the Contract, is, that the Surveyor and Contractor whom he judges capable of the works, and who has undertaken them at the loweſt price, enter into a covenant before a Notary; that this covenant begin with explaining all the articles of the Devis, or rather be a copy of the Devis itſelf; that therein be ſpecified the time in which the works are to be finiſh'd; how long the undertaker is to warrant them, and that he give ſecurity for that purpoſe; the Prince to oblige himſelf to advance the funds, in proportion as the works are advanc'd, and to procure all neceſſary means to facilitate the execution. *Secondly*, As ſoon as the Contract is made, the Director-Ingineer, and Surveyor, is to ſend to the Miniſter who has the charge of the Fortifications, a copy of the Devis and Contract, with a Schedule, in which the prices of each piece of work, and the names of the undertakers are ſet down in the margin overagainſt them, that he may ſee at once what the expence of the whole amounts to, and take his meaſures accordingly for the remittance of the funds: This likewiſe will be a means to prevent all opportunities of making alterations in the prices already ſettled, whether intended in favour of the undertaker, or to oblige him to give up his bargain.

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12. To oblige the Ingineer-director, who made the Project, to trace the works himſelf; as no one can or ought to do it with greater exactneſs than the Author, who therefore ſhould have the whole glory or diſcredit of it; when it is turn'd over to another, and ſome fault is found in it at laſt, the Author lays it to the charge of him who traced it, and the tracer lays it to the author; beſides, ſome difficulty or other may ariſe, ſuch perhaps as it was not poſſible to foreſee, and nobody fitter to find a remedy for it than he who projected the deſign. The Director ſhould likewiſe be obliged to give the Ingineers who have the charge of carrying on the works, the plans, elevations and profils, mark'd with their references, and ſign'd, and memorandums of all particularities and precautions to be obſerv'd, that if any thing ſhould befound amiſs, the fault may be imputed to the right perſon.

13. Not to begin upon any work till the magazine of materials is firſt prepared, both of ſuch things as may be neceſſary to expedite the works, and to finiſh them in as compleat a manner as is poſſible.

'Nothing, ſays M. *Vauban*, is ſo neceſſary in 'works of Fortification as diligence, and nothing 'more repugnant to that, than the great preci-'pitation with which they are generally begun, 'without having made the neceſſary proviſion 'of materials before-hand, or being aſſured of as 'many workmen as you may have occaſion to employ;

'employ; from this hurry at ſetting out it fre-
'quently comes to paſs, that before the works
'are half made, I don't know how many things
'are wanting, which never fails to occaſion a
'dangerous delay, a conſiderable encreaſe of
'expence by the extraordinary aſſiſtance you
'are obliged to get elſewhere, and for which
'you ſometimes pay very dear, to ſay nothing
'of the great damage the country ſuffers by the
'impoſition of peaſant-work and carriage, when
'the Peaſants perhaps are in the midſt of their
'harveſt; for which reaſon I repeat it once
'again, that a work ſhould never be begun
'without effectual meaſures being firſt taken
'for a ſupply of materials, and ſo large
'a magazine prepared, that the number of
'workmen intended to be employ'd there may
'never want; and this ſhould be the more ex-
'actly obſerv'd, as nothing is ſo hazardous for
'a Place as delay in the works, becauſe till
'they have acquired their utmoſt perfection
'the Place is in continual danger, being conſi-
'derably weaken'd by the natural imperfect
'ſtate of the works, by the heaps of materials
'ſpread all about, by the great gaps left in
'the cover'd ways for the carriages to paſs, by
'the filling up of the ditches, all accidents in-
'ſeparable from unfiniſh'd works; from whence
'it follows, that till a work has acquired its
'utmoſt perfection, it is always againſt the
'Place, that is to ſay, rather hurtful than any
'way conducing to its defence. Unhappy

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'ſituation, and to be dreaded by all who 'have the charge of works in a linger- 'ing way, ſuch I mean as flag for want 'of proper meaſures taken before-hand to for- 'ward them as they ought, and more eſpecially 'in time of war, when the enemy may form an 'enterprize againſt them every moment. There 'is nothing more common in the hiſtory of 'paſt or even preſent wars, than inſtances of 'places which have been either taken by ſur- 'prize, or abandon'd by conſtraint, before their 'Fortifications were put in a condition of de- 'fence.'

This vaſt collection of materials conſiſts of ſtone, lime, ſand, wood, *&c.* means likewiſe muſt be contrived for getting water, with as little expence as poſſible, if it is to be fetch'd from far; and if there ſhould be a neceſſity for driving piles, and for draining the water from the foundations, the proper machines muſt be provided for thoſe purpoſes. Tho' our intent is to be as brief as poſſible, and not to enter into particulars in this chapter, we ſhall however mention two precautions to be obſerved in regard to ſtones and ſand. They are taken notice of in *Vitruvius*; 'When one is obliged to make uſe 'of ſoft ſtones, ſuch as are apt to molder, they 'ſhould be taken out of the quarry in ſummer- 'time, never in winter, and expoſed to the air 'in ſome open place two years before they are 'uſed; thoſe which have receiv'd any damage

* *Lib.* II. *Chap.* vii.

'from the hard weather to be thrown into the 'foundations, thoſe which have ſtood that 'natural teſt, and proved good, to be us'd in the 'maſon work above-ground. This method 'ſhould be obſerv'd with regard to the ragg-'ſtone as well as free ſtone. On the other 'hand, ſand ſhould never be taken out of the 'pit but only as 'tis wanted, becauſe when it is 'kept a long time, the ſun and the moon change 'it, the rain even diſſolves it, and turns it al-'moſt all into earth, by which means it becomes 'quite uſeleſs for binding ſtones, or building ſtout 'walls capable of ſuſtaining any great weight; 'however that ſand newly taken out of the 'pit, is not ſo good for facings as it is for inſide 'maſon work, being of a clayey nature, and 'growing dry ſo faſt, that when it is mixt 'up with lime and ſtraw, the mortar made 'of it is very apt to crack; for which rea-'ſon the river-ſand, which is leſs clayey, is better 'for facings, provided it is well mixt up.'

Theſe and all the reſt of the materials muſt be ſtow'd as near as poſſible to the places where they are to be uſed, in ſuch a manner however as not to ſtop the paſſing of the carriages, or incommode either the works or workmen.

14. Before any work is begun, to make a valuation of the houſes belonging to particular perſons, on whoſe ground the Fortification is to ſtand, and even to pay them their money before-hand if it be poſſible; it being but reaſonable that the owner, whoſe property you take away without asking his conſent,

ſent, and generally for a very mean conſidera-
ration, ſhould not fall ſhort of his yearly in-
come by waiting too long for his principal.

15. 'To regulate and diſpoſe of employ-
'ments according to the immediate demand of
'the works, and the capacity of each workman,
'to the end that none be employ'd but ſuch as
'are uſeful and neceſſary, nor any charged with
'the care of what they dont underſtand, or
'with more than they can perform. Miſma-
'nagement in this point being the uſual origin
'and ſource of all the diſorders that ariſe in
'the conducting works of Fortification.

16. Never to make any change in the per-
ſons who have been once charg'd with the
execution of the work, before it is entirely
finiſh'd: According to Mr. *Vauban*, who inſiſts
upon it, 'that nothing is more deſtructive of all
'œconomy, and oppoſite to the advancement of
'works, than the frequent changing thoſe per-
'ſons who have the principal care of them,
'particularly the Ingineers; as from this ſhift-
'ing of hands it comes to paſs, that no one is
'thoroughly inſtructed in his buſineſs; that the
'perſon employ'd is always a novice in it, and
'never thoroughly acquainted with the quality
'or value of the materials, or the capacity of
'the workmen; that they neither know the
'beſt means for conveyance of thoſe materials,
'nor what method to take to eſtabliſh good
'order in that particular; things however neceſ-
'ſary to be known, but only to be learnt by
'time and experience. I will venture further to

'ſay what is but too certain, that let them take 'never ſo much pains to make themſelves maſters 'of their profeſſion, the Sovereign, at whoſe ex-'pence they are taught, always pays dearly for 'their apprenticeſhip; for if it is undoubtedly true, 'that in the beginnings of all great works what-'ever, it is impoſſible even for the moſt skilful 'in the profeſſion, with all the application they 'are maſters of, to prevent the expence exceeding 'what it ought to be, by a fifth or a ſixth part, 'how muſt it fare with the works of thoſe 'places who have every year a new Director, 'and where none have time ſufficient to learn the 'duties of their ſtation? Such a conduct can 'produce no other fruits but deſigns ill-exe-'cuted, and a monſtrous aggravation of ex-'pence; for which there is no other remedy, 'but to make good choice once for all of the 'ſeveral perſons intended to be employ'd; to 'have patience with them till they are tho-'roughly acquainted with their buſineſs, and 'then to continue them in their employments 'as long as there is any occaſion for them, or 'they behave as they ought.

17. 'By no means to ſuffer thoſe who have 'any charges in the works to introduce their 'domeſticks to be employ'd in them under any 'pretence whatſoever, any more than their 'horſes or their valets; becauſe ſuch a proceed-'ing would give great cauſe of ſuſpicion, as it 'might introduce ſuch compliances in favour of 'the undertaker as are not fairly to be explain'd: 'They even ought not to be allow'd to employ

'their

'their relations, or any perſons however recom-'mended, without the Miniſter's conſent.'

18. To regulate the manner of adjuſting the eſtimate every year, which ought to be done as follows:

1. The Surveyors every year ſhould deliver copies to the chief Ingineers of the place, with the pages figur'd from firſt to laſt, indented, examin'd, and ſign'd by the former.

2. The ſeveral articles therein, to be ſet down according to the order preſcribed by the articles of State, that it may be ſeen at once whether the funds exceed the expence, or the expence the funds.

3. That in the meaſurement, whether particular or general, the ſpot of ground, and part of the works, the name of the work itſelf, and of the undertaker, be ſpecified, and theſe mark'd in the plans with a cypher and reference, ſo as to be found with eaſe, if there ſhould be occaſion to verify them: That the dimenſions be given, and the product of them, the parts diſtinguiſhed, when there are ſeveral in one piece; and the computation always made in toiſes, feet, and inches, that way of computing being the cleareſt, the moſt in uſe, and leaſt ſubject to the intricacies of fractions.

4. That the meaſurement be perform'd by a ſubaltern Ingineer in preſence of the chief Ingineer, or by the chief Ingineer if there be no ſubaltern.

5. 'That the undertakers be not suffered to 'begin upon any work whatsoever, till they 'have first had the figure given them, and its 'exact dimensions, its several heights and depths 'mark'd, an estimate made of the whole, 'and a sign'd copy given them of the con-'tents; as soon as the works are finish'd 'they are to be measured the second time, and 'if the last measurement differs from the first, 'the lowest computation shall be taken for the 'King's account; this is to be understood of 'earth-works only, or removals of ground, for 'as to the masonry in the foundation, such alte-'rations may be necessary as that it may be im-'practicable to make it tally with the first mea-'surement, without running willfully into error. 'When that kind of work is begun, as fast as it is 'carried up, exact memorandums are to be taken 'and sign'd by the Ingineer, the Contractor, and 'principal Officers of the work, in which the 'breadth, length, and elevation of every parti-'cular part are to be distinctly and clearly set 'forth, and the spot exactly described to avoid 'all kind of perplexity or fraud in the general 'toise account. The part referred to is like-'wise to be represented in the margin as often 'as it shall be thought necessary for farther ex-'planation.'

As to the carpenters work, an account must be taken of all the timber made use of, and like-wise of all that is not.

An account must be kept of the weight of all the iron and lead works.

6. All

6. All earth-works to be meaſured by the excavations of the ditches from whence the earth is taken, and by the cubical toiſe, not by the meaſure of the country.

The maſon-work to be meaſured by the cubical toiſe if walls of a great thickneſs, or by the toiſe-ſquare if only ſingle walls, as caſerns, ſtore-magazines, Corps de Gardes, and ſuch like.

The timber-work to be meaſured by the * *Solive.*

All the iron-works to be weigh'd by the pound.

19. To oblige the chief Ingineer, to give every month to the Miniſter and Surveyor, an account of the ſtate of the works of the Place, and to the Director as often as he ſhall want to have any part of the deſign explain'd, or to have his opinion of any part of the works.

In that memorial firſt are to be enter'd the works order'd to be made. 2. In the margin is to be ſet down the ſtate in which they are at preſent, and what ſums have been laid out. 3. At the end a recapitulation, in which is to be expreſs'd the total of the monies receiv'd, and what has been expended, and of the caſh remaining in hand, or the exceſs of the expence beyond the fund. 4, Is to be ſet forth what money has been paid the contractors on account of the expence, what remains due to them, or what they are over-paid. To this, if neceſſary, ſhall be annex'd another account of the mate-

* *A particular French meaſurement, being a paralleli-pipedon, 3 feet high, whoſe baſe is a foot ſquare.*

rials in ſtore, and the value of them, in which is to be a liſt of the workmen and labourers employ'd in the works, of the ſoldiers and others, with a recapitulation and total at the end. To this muſt be added an account of the train or equipage; that is to ſay, the number of carriages, horſes, or other cattle, *&c.* and a total at the end.

20. To regulate the manner of ſettling the account at the end of each year, which form muſt be nearly the ſame with that above-mention'd.

21. To ſettle the forms to be obſerv'd when any work is to be receiv'd as finiſh'd. This ceremony is to be perform'd in the preſence of the Governors, the King's Lieutenants, Majors, Mayors, Sheriffs, that the whole act may be authentick, as M. *Vauban* adviſes.

22. To make a law, that 'whenever it ſhall 'be thought proper to open any part of the 'rampart, to let the water out of the ditch, to 'overflow any part of the environs, or laſtly, 'to level any of the cut-works, in order to make 'new ones there, nothing of this kind be done 'till the permiſſion of the Governor, or of him 'who commands in his abſence, is firſt obtain'd. 'It being but reaſonable this deference ſhould 'be paid to thoſe perſons whoſe honours and 'lives are reſponſable for the ſafe keeping of 'the Place.'

23. To make it a rule likewiſe, when any improvements are intended in the works of a place, always to begin with the cover'd way

of

of the part that is defective, and then to proceed to the works moſt advanc'd, that it may not be in the power of an enemy to ſurprize the place whilſt it lies open, or to interrupt the works. And for the ſame reaſons not to demoliſh all the old works at once, but one after another, and that not till all the neceſſary materials are collected in order to the rebuilding of them.

CHAP. IX.

Of the neceſſity of keeping Fortreſſes conſtantly provided with all things neceſſary for their defence.

FORTRESSES, ſays M. *Vauban*, are only ditches and ramparts, diſpos'd in ſuch a manner that the ſeveral parts of them ſee and defend each other; which parts themſelves being only ſo many heaps of dead matter, have no virtue but what conſiſts in their numbers, diſpoſition, and ſubſtance, nor active power but what is communicated to them by thoſe employ'd in their defence, to render them effective. As a place therefore, tho' never ſo ſtrong in itſelf, cannot poſſibly exert or put in act that ſtrength without human aſſiſtance, theſe men to be capable either of acting or ſubſiſting will want arms and ammunition for their defence, and bread for their ſupport. It is not therefore ſufficient for the defence and ſafety of a State to

have

have Fortreſſes, but thoſe again muſt be provided with all things neceſſary for that purpoſe. Without this precaution they will rather be diſadvantageous than uſeful: The enemy may get poſſeſſion of them with eaſe, and turn them againſt the Sovereign who built them.

It is not for a State to think itſelf abſolutely ſecure, either becauſe ſhe is herſelf at peace with all her neighbours, or becauſe they are ſo likewiſe amongſt themſelves. How many Princes, depending entirely upon the faith of a treaty, have at laſt found themſelves deceiv'd: And how many towns been attack'd without any previous declaration of war? The enemy may have long ſince made their preparations, or may at any time make them ſo ſecretly or ſo ſuddenly, or colour them with pretences, having ſo much the appearance of truth, as the artifice may not be perceiv'd till 'tis too late. Politicians leſs wiſe and wary than the *Venetians*, would have been entirely lull'd aſleep by the *Turks* proteſtations, when they laid their deſign of attacking *Venice* in the year 1646.

Beſides, the ammunition and victualling ſtores neceſſary for a number of Places, amount to ſo conſiderable an expence, that a Prince, if he has not a great deal of money before-hand, may happen to find himſelf not in a condition of ſupplying them at a time, when ſome of them perhaps may be on the very brink of an attack. This accident befell the States of *Holland* in the year 1672; a great many of their towns ſurrender'd, becauſe they were themſelves unable, both

both time and funds falling ſhort, to ſupply them with every thing neceſſary to make a good defence.

The ſafeſt way therefore is conſtantly in every Place to keep the principal things neceſſary for its defence. However there are ſome particulars to be conſider'd on this head, and ſome diſtinctions to be made, as we ſhall preſently ſhow.

For the guard and defence of a Place, as we have ſaid before, men, arms, and proviſions, will be required.

The number of men ſhould be greater or leſs, as the Place is in more or leſs danger of being attack'd.

Of arms there ſhould always be kept the full number neceſſary for its defence; as the keeping them in repair is a very inconſiderable expence. Under the name of arms are comprehended not only ſmall arms, but cannon, ammunition, and whatever belongs to the train of artillery. Note, that in regard to powder 'tis better having a proviſion of the ingredients of which it is compoſed, then the ſame quantity of powder ready made, becauſe by long keeping it loſeth its ſtrength, and grows good for nothing.

As to Proviſion, every Place ought at leaſt to be provided for as long a time as it would be able to hold out againſt any attack of open force, or even of famine; and ſhould have ſuch good orders made for its preſervation, that it may not be in the liberty even of the Governor, to whom the diſpoſal of it properly belongs, either to waſte

waſte or embezzle it. Such a conduct cannot but be advantageous even tho' a Prince were certain his towns would not be attack'd; for the harveſt happening to fail in ſome part or other of the country, thoſe magazines would be a great benefit to the ordinary people. To preſerve thoſe victualling ſtores always in a good condition fit for uſe, ſuch of them as would keep no longer muſt be diſpoſed of every year, and freſh laid in. All that can be objected againſt making theſe proviſions is the difficulty of preventing tricks in the perſons entruſted with the management of them, but good laws, ſtrictly executed, will be a means of preventing all frauds of that kind.

The circumſtances neceſſary to be conſider'd in regard to furniſhing Places with ſtores, are, the manner in which they are liable to be attack'd, whether by ſurprize, force, or famine; the Sovereign's power to whom they belong, their own magnitnde, their importance to the State, and the advantages or diſadvantages of their ſituation.

In a Place liable to be ſurprized, there ſhould never be kept a great quantity of ammunition or proviſion, unleſs it be upon the brink of being beſieg'd, and the garriſon ſo ſtrong as to be in no danger from attacks of that kind; but if a neceſſity ſhould happen of making magazines there, not for the defence of the place itſelf, but with ſome other view, the garriſon muſt be made very ſtrong, and double care and caution uſed for their preſervation.

In

In Places out of danger of a ſurprize, but liable to be attack'd by force, there ſhould be no greater quantity of ammunition or proviſion kept, than juſt ſufficient to maintain them as long as they may be ſuppos'd to be capable of ſuſtaining thoſe kinds of attacks.

And in Places which are to be taken by famine only, there ſhould always be a quantity of proviſion ſufficient to maintain them for as long or even a longer time than the beſiegers army can poſſibly lie before the Place.

Places, in general, belonging to Princes of ſlender power, ſuch as are not in a condition either of forcing an enemy to raiſe the ſiege, or of throwing in ſuccours themſelves, ought conſtantly to be provided with whatever they may want to enable them to ſuſtain a ſiege.

Great towns are very apt to fall ſhort of proviſions, for which reaſon a more than ordinary care ſhould be taken to keep them well ſupplied; when there is reaſon to apprehend their being beſieged, all the forage and proviſions of the neighbouring country ſhould be drawn into the Place, or whatever cannot be got in, upon the near approach of the enemy, ſhould be burnt or deſtroy'd, that the enemy may not reap the benefit of them.

Places which are of general importance to a State, ſuch as command the entrance of the Kingdom, ought not only to be kept conſtantly provided with every thing neceſſary to a good defence, but ſhould likewiſe have a ſtrong garriſon,

riſon, and as watchful an eye as poſſible kept over them for their preſervation.

In Places of leſs importance, and in Fortreſſes of the ſecond line, there need only the uſual numbers to guard and garriſon them, and a few ſtores; deferring, till they are threaten'd with a ſiege, the ſending ſuch a quantity thither as may be neceſſary for their defence under thoſe circumſtances.

If a Place is difficult of attack by force, it ought to be furniſh'd with ſuch a garriſon, and ſuch a quantity of ammunition and proviſions as may be ſufficient to fruſtrate all ſuch attempts in an enemy.

If a Place is very weak, it will need only ſuch a garriſon, and quantity of proviſions, as may be ſufficient to ſerve them during the ſhort time they are able to ſuſtain a ſiege, and a few days over. Too ſtrong a garriſon would occaſion too great a conſumption of proviſions, and too great a quantity of ammunition, might ſerve the beſiegers, for ſome other expedition they might have in view; or if they had no ſuch intention before, might put it into their heads. This however is contrary to the maxims of the *Turks:* They never trouble themſelves about making a great many works in their Fortifications, nor even about any advantages of ſituation; they depend wholly upon their numbers for their defence, and upon their quantity of ammunition and artillery, with which their frontier places are always well ſtored; but experience has taught us, that either

a happy

a happy ſituation, or a few good works, will ſupply the defect of numbers in a garriſon; beſides, that maxim of the *Turks*, is only practicable for Princes of very great power, and whoſe dominions are very populous.

When a Place is capable of receiving ſuccours of all kinds with eaſe, how important ſoever it may be to the State, and how eaſily ſoever attack'd, there is no neceſſity fully to provide it with neceſſaries of all kinds for its defence; of this kind are ſome towns ſituate on great rivers, and all ſuch as ſtand upon the ſea coaſt with good harbours to them, becauſe as the whole coaſt can neither be attack'd nor ſhut up, the Sovereign will always have it in his power to ſend them freſh ſupplies.

If the neighbouring country furniſhes enough and more than enough of neceſſaries of all kinds for the ſubſiſtance of the garriſon and inhabitants, there is no occaſion to have a ſtore in reſerve; 'tis ſufficient that the Governor be always attentive to the enemy's motions, taking ſuch meaſures, as to have time enough to receive into the Place all, or the greateſt part of the country proviſions, and to deſtroy what cannot be brought in.

In Places, where the neighbouring country is barren, and which are not eaſily to be ſuccour'd on account of their ſituation, and the badneſs of the ways for carriage, the beſt maxim, is conſtantly to keep upon the ſpot almoſt every thing neceſſary for their defence, the full numbers of the garriſon excepted; men

being

being that kind of ſupply, the eaſieſt thrown into a Place.

In Towns which have Citadels, 'tis ſafer keeping the ſtores in the Citadels than in the Towns; becauſe if the latter ſhould be ſurpriſed or carried by force, there may not be ſufficient time for removing them into the former. * 'In the year 1600 the Town of *Bourg* having been taken by Petard, the aſſailants found themſelves maſters of the victualling ſtores which had been laid up there, and immediately afterwards inveſting the Citadel, the garriſon, for want of proviſion, was obliged to capitulate much ſooner than they would otherwiſe have done.

When once a Place is ſtored, nothing ought to be taken from thence in expectation of an opportunity of replacing it, more eſpecially in time of war. The year 1595, the Town and Citadel of *Cambray* were obliged to ſurrender through a miſconduct of this kind. The *Spaniards* being appriſed of the avaritious humour of the Dame *Balagny*, as the corn had been ſomething dear in *June* and *July*, found means to draw it all out of her granaries, by purchaſing it at her own price. The Town was inveſted before the return of harveſt gave an opportunity for a freſh ſupply; at length the Dame perceiv'd that with her corn ſhe had ſold her Sovereignty.

* *Mezeray.*

FINIS.